



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>



Department of
Mineralogy & Petrography
HARVARD UNIVERSITY
Cambridge, MASS.



TWENTIETH ANNUAL REPORT
OF THE
UNITED STATES GEOLOGICAL SURVEY

TO THE
SECRETARY OF THE INTERIOR

1898-99

CHARLES D. WALCOTT
DIRECTOR

IN SEVEN PARTS

PART VI—MINERAL RESOURCES OF THE UNITED STATES, 1898
METALLIC PRODUCTS, COAL, AND COKE

DAVID T. DAY, CHIEF OF DIVISION



WASHINGTON
GOVERNMENT PRINTING OFFICE
1899

TWENTIETH ANNUAL REPORT
OF THE
UNITED STATES GEOLOGICAL SURVEY

PART VI—MINERAL RESOURCES OF THE UNITED STATES, 1898
METALLIC PRODUCTS, COAL, AND COKE

CONTENTS.

	Page.
LETTER OF TRANSMITTAL	1
INTRODUCTION	3
SUMMARY	5
General remarks	5
Metals	6
Fuels	8
Structural materials	10
Abrasive materials	11
Chemical materials	11
Pigments	12
Miscellaneous	14
IRON ORES, BY JOHN BIRKINBINE.	
Production	27
The Lake Superior region	31
The industry in various States	37
Value	42
Stocks	43
Prominent iron-ore producers	45
Transportation	47
Imports	53
Exports	55
Montana iron ores	55
STATISTICS OF THE AMERICAN IRON TRADE IN 1898, BY JAMES M. SWANK.	
General review of the domestic iron trade	61
General statistical summary	64
Average monthly prices of iron and steel	65
Prices of Lake Superior iron ore	67
Imports of iron ore	68
Lake Superior iron-ore shipments	69
Receipts of iron ore at Lake Erie ports	70
Consumption of iron ore	70
Imports of manganese ore from Cuba	71
Imports of iron and steel	71
Exports of iron and steel	72
Exports of agricultural implements	73
Production of pig iron	74
Total production of pig iron from 1894 to 1898	75
Production of pig iron according to fuel used	76
Consumption of pig iron	76
Limestone consumed in making pig iron	77
Production of Bessemer steel	77
Production of open-hearth steel	78
Production of crucible steel	79

	Page.
Production of miscellaneous steel	79
Total production of all kinds of steel	80
Production of iron and steel rails	80
Production of iron and steel structural shapes	81
Production of plates and sheets	82
Production of wire rods	82
Production of wire nails	83
Production of cut nails	84
Total production of all rolled iron and steel	84
Production of rolled iron and steel in the United States from 1887 to 1898	86
Production of Allegheny County, Pennsylvania	86
Iron and steel ship building	87
Production of iron blooms and billets	87
Production of tin plates	87

THE FOREIGN IRON TRADE IN 1898 AND IMMEDIATELY PRECEDING YEARS,
BY JAMES M. SWANK.

Introduction	89
Great Britain	90
Germany	91
France	93
Belgium	93
Austria-Hungary	94
Sweden	95
Norway	95
Spain	95
Portugal	96
Italy	96
Russia	96
Greece	97
Japan	97
China	98
India	98
Australasia	98
South African Republic	98
Dominion of Canada	99
Newfoundland	99
Brazil	99
Bolivia	99
Detailed statistics of Canadian iron trade for 1898	99
World's production of pig iron and steel	101

GOLD AND SILVER.

Production	103
History of gold mining and metallurgy in the Southern States, by H. B. C. Nitze	111

MANGANESE ORES, BY JOHN BIRKINBINE.

Production of manganese ores	125
Production of manganiferous iron ores	127
Production of manganiferous silver ores	128
Production of manganiferous zinc residuum	129
Production and value of manganese and manganiferous ores reported in 1898	130

CONTENTS.

VII

	Page
Production of manganese in various States	130
Imports	136
Production of manganese in foreign countries	138
World's production of manganese ores	156
Characteristics of manganese ores	157
The uses of manganese	158

COPPER, BY CHARLES KIRCHHOFF.

General trade conditions	159
Production	159
Imports	187
Exports	194
The copper markets	198
The world's production	202
The English copper trade	206
The French copper trade	212
The German copper trade	214
The Russian copper trade	216
The leading foreign producers	217

LEAD, BY CHARLES KIRCHHOFF.

Introduction	221
Production	222
Consumption	231
Imports and exports	233
Warehouse transactions	240
Prices	242
The lead market	244
The world's production	245
The world's consumption	247

ZINC, BY CHARLES KIRCHHOFF.

Production	249
Zinc mining in Galena-Joplin district	252
Consumption	254
Imports and exports	254
Prices	259
Foreign spelter production	263

ALUMINUM AND BAUXITE.

ALUMINUM	267
Production	267
Imports	268
BAUXITE	269
Production	269

QUICKSILVER.

Production	271
Imports	274
Prices	274

VIII

CONTENTS.

NICKEL AND COBALT.

	Page
Production	277
Imports and exports	278
Foreign production	280

ANTIMONY, BY EDWARD W. PARKER.

Production	283
Recent developments	285
Imports	285
Prices	286
Uses	288

CHROMIC IRON ORE.

Production	291
Imports	292

PLATINUM.

Production	293
------------------	-----

COAL, BY EDWARD W. PARKER.

Introduction	295
The coal fields of the United States	297
Production	305
Labor statistics	324
Prices	327
Imports and exports	329
World's product of coal	332
Coal mined by machines in 1898	342
Coal-trade review	347
Production of coal by States	393

THE MANUFACTURE OF COKE, BY EDWARD W. PARKER.

Introduction	509
Production of coke in the United States	510
Imports and exports	543
By-product coke making in 1898	544
Production of coke by States	554

LETTER OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
UNITED STATES GEOLOGICAL SURVEY,
DIVISION OF MINERAL RESOURCES,
Washington, D. C., September 1, 1899.

SIR: I have the honor to transmit the fifteenth annual report on the mineral resources of the United States. It bears the title *Mineral Resources of the United States, 1898*. As usual, it carries the statistical record of the mineral development of this country to the end of the calendar year concerned, in this case to December 31, 1898, and contains in addition much descriptive matter collected while the statistical canvass was being finished. Much of the matter has found prompt publication in accordance with the law providing for the printing of each chapter as soon as completed.

In accordance with your instructions, the report for the calendar year 1899 is in preparation.

Very respectfully, your obedient servant,

DAVID T. DAY,
Geologist in Charge.

Hon. CHARLES D. WALCOTT,
Director, United States Geological Survey.

MINERAL RESOURCES OF THE UNITED STATES, 1898.

DAVID T. DAY, *Chief of Division.*

INTRODUCTION.

The arrangement and scope of this volume are practically the same as in the fourteen volumes of the series, *Mineral Resources of the United States*, which have preceded it. The object of the volume is to record the developments in the mineral industries of the United States since the last report. The reports should be consulted together. Every chapter treated in this report, with the exception of that concerning the mineral resources of Porto Rico, is a census of the industry as complete as possible with the means at disposal. The statistics of the production of gold and silver, as usual, are the work of the Director of the Mint, Treasury Department, and are accepted as official. The statistics of the imports and exports of minerals, which form an essential part of the volume, are obtained through the courtesy of the Chief of the Bureau of Statistics, Treasury Department.

The totals given below will be found to differ somewhat from those published on the chart showing the mineral products of the United States from 1889 to 1898, and from the summary published in pamphlet form. This is caused by the receipt of revised figures from special agents in charge of the statistics of some of the more important minerals.

ACKNOWLEDGMENTS.

Except as noted above and in a few isolated instances where some other well-established agency already exists by which the statistics are collected accurately, the figures are obtained direct from the producers, and it is impossible to acknowledge here, otherwise than by brief mention, the invaluable assistance which has been freely rendered by them and the voluntary contributions of many local experts. The names of the statistical experts who, acting under the authority of the United States, have collected statistics from the producers are given at the heads of the special chapters. The technical press,

besides affording much information concerning new mining enterprises, has been largely drawn upon for prices, market reports, and new technical processes.

As heretofore, the publication of this volume has been anticipated to a great extent by the issuance in advance, in pamphlet form, of the several chapters which compose it. Before the issuance of this volume all of the chapters, except a few of the minor minerals, will have been so given to the public.

The following summary gives the principal statistical information in in this report.

SUMMARY OF THE MINERAL PRODUCTION OF THE UNITED STATES IN 1898.

GENERAL REMARKS.

Owing to the great variety in the units of measurement, the only factor common to all the mineral products and the only means by which the totals can be expressed is the value. The statistics presented in the accompanying tables show that since 1880 the total value of the mineral production of the United States has increased from \$369,319,000 to \$697,820,720 in 1898—nearly 90 per cent. The normal increase deduced from this record of 19 years is at the rate of \$18,000,000 annually, but during the five years since 1893 the rate of increase has been nearly \$25,000,000 annually. While the normal rate of increase may lie somewhere between these figures, the totals are marked by great irregularities. From 1894 to 1895 the increase was nearly \$100,000,000, and in the following year the increase was only a little over \$1,000,000, while in the two years from 1892 to 1894 there was a decrease, owing to the business depression, of over \$121,000,000. From 1896 to 1897 the increase was about \$8,000,000, about 1.3 per cent, while from 1897 to 1898 the increase was \$66,966,791, more than two and one-half times the average annual increase from 1893 to 1898, and a gain of nearly 11 per cent over the value of the product in 1897 (\$630,853,929). The total of \$697,820,720 in 1898 was the largest ever recorded in the history of the United States, exceeding that of 1892, which held the record prior to 1898, by nearly \$50,000,000. This great increase in 1898 is due to a general increase all along the line of mineral products, all of the more important of these showing large increases and almost every one showing some gain. The value of all metallic products in 1898 was \$343,400,955 as compared with \$302,198,502 in 1897, a gain of \$41,202,453. All of the metals except nickel made large gains, copper, lead, zinc, aluminum, and antimony reaching their maximum in both production and value; but while the amount of pig iron produced in 1898 was greater than in any other year, yet the value of this product was considerably less than in 1890 or 1892, though it increased \$21,434,701 over 1897, this being more than one-half the total increase in the metallic products from 1897 to 1898. The non-metallic products increased from \$327,655,427 to \$353,419,765, a gain of

\$25,764,338. The largest contributor to this gain was bituminous coal, which increased from \$119,567,224 in 1897 to \$132,586,313 in 1898, a gain of \$13,019,089. The value of the anthracite, however, fell off nearly \$4,000,000. The other products showing important gains were stone, petroleum, natural gas, and mineral waters.

In presenting these statistics unnecessary duplication has been avoided. The coke product, discussed in the following pages, amounting to over 16,000,000 short tons, with a value of approximately \$25,000,000, is excluded from the tabulation, as the quantity and value of the coal used in its manufacture is included in the statistics of coal production. Similarly, white lead, red lead, and litharge, whose average aggregate value for the past ten years has exceeded \$10,000,000, are not given in the table, the base from which they are made being included in the output of pig lead. Zinc oxide or zinc white, made direct from the ores and consequently not included in spelter production, is tabulated. The product of pig iron and its value are given in the tabulation as the best means of presenting the statistics of production in the first marketable condition. The value of brick and pottery clays rather than the value of the manufactured products is embraced in the tabular statement, although the statistics of brick, tile, and pottery production are presented in detail in the report. Inflation of valuation and all unnecessary duplication are thus avoided.

METALS.

Iron and steel.—The year 1898 proved to be another record breaker in the production of pig iron, 11,773,934 long tons being made in that year as compared with 9,652,680 in 1897, the largest output up to that time. This is an increase of 2,121,254, or nearly 22 per cent. Large as was the increase in product in 1898 as compared with 1897, it was not so large as the increase in 1895 over 1894. In 1894 the product was 6,657,388 tons and in 1895 it was 9,446,308, an increase of nearly 42 per cent. In 1897 the increase was 1,029,553 tons, or 11.94 per cent over 1896, and while the quantity was greater than in any other year up to that time, the value (\$116,557,000) was \$34,643,410 less than that of the product in 1890, which was the year of maximum value, though the product in 1890 was only 9,202,703 tons, or 2,571,231 tons less than in 1898. The average value per ton of pig iron increased from \$9.85 in 1897 to \$9.90 in 1898. This is the first rise in value per ton noted for some years, the average per ton being: 1895, \$11.14; 1896, \$10.47; 1897, \$9.85.

The production of Bessemer steel ingots was 6,609,017 tons, as compared with 5,475,315 tons in 1897, 3,919,906 tons in 1896, and 4,909,128 in 1895. The production was more than double that of 1893.

The total production of open-hearth steel in 1898 was 2,230,292 long tons, against 1,608,671 tons in 1897, an increase of 621,621 tons—over 38 per cent.

Iron ores.—The value of the iron ores mined in the United States in 1898 was \$22,060,887, as compared with \$18,953,221 in 1897, a gain of \$3,107,666, thus nearly attaining the value in 1896, when it was \$22,788,069. There was also a gain in the product of 1,915,670 long tons, or from 17,518,046 long tons in 1897 to 19,433,716 tons in 1898. The average price per ton in 1898 was \$1.14, as compared with \$1.08 in 1897 and \$1.42 in 1896.

Gold.—The product continued to increase, and in 1898 was valued at \$64,463,000, as compared with \$57,363,000 in 1897. In 1896 it was \$53,088,000.

Silver.—The coining value of the silver product in 1898 was \$70,384,485, or a commercial value of \$32,118,420; in 1897 the coining value was \$69,637,172, and the commercial value \$32,316,000. This is an increase in 1898 of \$747,313 in the coining value and a decrease of \$197,580 in the commercial value. The product increased from 53,860,000 ounces in 1897 to 54,438,000 ounces in 1898. In 1896 the product was 58,834,800 ounces.

Copper.—The copper industry continues to be in a flourishing condition. The product in 1898 was 526,512,987 pounds, valued at \$61,865,276, the greatest product and value ever recorded, 494,078,274 pounds, valued at \$54,080,180, having been produced in 1897. The average price per pound in 1898 was 11.75 cents; in 1897 it was 11 cents, and in 1896 it was 10.5 cents. The actual scarcity of copper, with its accompanying rise in price and its enormous expansion of stock speculation, did not develop until the end of the year, and did not affect the returns for 1898. Nor is the great activity in the location of new copper mines apt to add materially to the copper product of 1899 on account of the time required to open copper properties and provide reduction plants.

Lead.—The lead product increased from 212,000 short tons in 1897 to 222,000 tons in 1898, which is the maximum output of this metal in the United States. The value also increased from \$14,885,728 in 1897 to \$16,650,000 in 1898.

Zinc.—The production of zinc also increased to 115,399 short tons, valued at \$10,385,910, from 99,980 short tons, worth \$8,498,300, in 1897. This, too, is the largest product recorded for this country.

Quicksilver.—The production of this metal, which declined in 1897, shared the generally improved conditions in the mineral industries, increasing from 26,648 flasks in 1897 to 31,092 flasks in 1898. The value increased from \$993,445 in 1897 to \$1,188,627 in 1898. The value per flask in 1897 was \$37.28; in 1898 it was \$38.23.

Aluminum.—The production of aluminum also made a notable gain in 1898 over 1897. The product in 1897 was 4,000,000 pounds, valued at \$1,500,000, and in 1898 it was 5,200,000 pounds, valued at \$1,716,000.

Antimony.—The total amount of metallic antimony produced in 1898 was 1,120 short tons, as compared with 756 short tons in 1897. The value of the 1898 product was \$184,050 and in 1897 it was \$109,655.

This total includes the antimony derived from imported ores, about 80 per cent being so obtained. The amount of antimony ore mined in the United States in 1898 was 697 short tons, all of which came from the far West.

Manganese ore.—The production in 1898 was the largest since 1891, but while showing an increase of about 44 per cent over 1897 (from 11,108 long tons to 15,957 long tons) the output last year was barely two-thirds of that in the three years 1889, 1890, and 1891. The value of the product in 1898 was \$129,185, against \$95,505 in 1897.

Nickel.—The production of nickel declined sharply from 23,707 pounds in 1897 to 13,411 pounds in 1898. The domestic production is insignificant as compared with the consumption, the market being supplied chiefly from Canada.

FUELS.

Coal.—The combined product of anthracite and bituminous coal in 1898 amounted to 196,405,953 long tons, equivalent to 219,974,667 short tons, an increase of 9½ per cent over the product of 1897, which was 178,769,344 long tons, or 200,221,665 short tons. The actual increase in 1898 as compared with the preceding year was 17,636,609 long tons, or 19,753,002 short tons. The value of the product increased a little less than 5 per cent, from \$198,869,178 to \$208,000,850. This enormous production in 1898 made that year the banner coal-producing year in the history of the United States, as 1897 had been up to that time. The increased production in 1898 was almost exclusively of bituminous coal. There was an increase of 688,361 long tons in the output of anthracite coal, but of this increase 470,154 long tons was increased consumption at the collieries, so that the marketed product indicated an increase of only 218,207 long tons. In addition to this practically stationary condition of the anthracite production, the value of the anthracite product in 1898 was \$3,887,417 less than the slightly smaller output of the preceding year. The average annual production of anthracite coal in the last five years has been equivalent to 48,261,000 long tons, showing that the product in 1898 was about 600,000 long tons less than the average of the last five years. On the other hand, the production of bituminous coal increased from 131,794,630 long tons, or 147,609,985 short tons, to 148,742,878 long tons, or 166,592,023 short tons, a gain of 12.86 per cent. The actual increase in tonnage was 16,948,248 long tons, or 18,982,038 short tons, with an increase in value of practically \$13,000,000. For many years prior to 1898 the demand for bituminous coal has been less than the supply, and operators have consequently had to contend with a surfeited market. In 1898 these conditions were reversed, and instead of struggling to obtain new markets for their coal or endeavoring to hold the old ones, operators were for a great deal of the time unable to fill their orders promptly. This condition was not due to the extraordinarily cold weather, but almost entirely to

the demand for fuel in the iron and steel making and other industrial enterprises, the demand for coal being as steady throughout the summer as during the winter months. Demand for labor was so great in other branches of the industry that in many cases operators found it difficult to secure a sufficient number of miners and laborers to carry on their work. Notwithstanding this condition of affairs, however, the average price per ton received for bituminous coal in 1898 shows a decline from 81 cents in 1897 to 80 cents in 1898, this being a continuation of the period of decline in prices which has extended from 1887 to the close of 1898. The only cause which may be assigned for this rather anomalous condition of affairs is that the economies which have been forced upon producers during the preceding ten years have enabled the operators to produce coal at less cost to the consumer and at the same time at profits to themselves. Unquestionably the introduction of coal-cutting machinery in the bituminous coal mines of the United States has had much to do with this decreased value, and one of the striking features of the bituminous coal-mining industry in 1898 was the phenomenal increase in the product by the use of machines, this factor increasing from 22,649,220 short tons in 1897 to 32,413,144 short tons in 1898 and representing something more than 50 per cent of the total increase in the production of bituminous coal. Another factor which bears upon the decrease as shown in the average price is the increased production by the larger mining properties as compared with the smaller ones, the former being equipped with labor-saving machinery and consequently being able to produce and sell coal at a less figure. The increased production of the cheaper coal would have a tendency to lessen the average price for the State, whereas in reality there may have been no actual decline in the value at any one mine.

In discussing the production of anthracite and bituminous coal, the anthracite product of Colorado and New Mexico, the semianthracite product of Arkansas and Virginia, and the lignitic coals of Colorado, North Dakota, California, Oregon, and Texas, and semibituminous, cannel, splint, and block coals are included in the bituminous product.

Out of the thirty States which contributed to the production in 1898 there were twenty-two in which the output was the largest on record. The total product of anthracite and bituminous coal in 1898 was a little more than three times that of 1880, the first year covered by this series.

Coke.—In the production of coke, as in the production of coal, the year 1898 was one of unprecedented activity, the output in that year amounting to 16,047,209 short tons, an increase from 13,288,984 short tons in 1897, and equivalent to an increase of 2,713,494 short tons, or a little more than 20 per cent over the output in 1895, which was the year of largest previous production. This increase in the manufacture of coke in 1898 may be traced directly to the impetus given to the iron and steel working industries during last year. The actual increase in 1898 over 1897 was 2,758,225 short tons, of which practically 1,700,000 tons were in Pennsylvania, and of this increase in Pennsylvania,

1,450,000 tons were in the increased output from the Connellsville region alone. The production of West Virginia, which is the second largest producing State, was 1,925,071 short tons, an increase of 452,405 short tons, or 30.72 per cent over that of 1897. Alabama increased its production from 1,443,017 short tons to 1,663,020 short tons, a gain of 220,003 short tons, or 15.25 per cent. Virginia's production increased 50 per cent, from 354,067 short tons to 531,161 short tons. Colorado (including a small amount from Utah) increased from 342,653 short tons to 474,808 short tons, a gain of 132,155 short tons, or 38.6 per cent. The production increased in 12 States and decreased in 8 States, but the aggregate of the decreases in the 8 States was less than 50,000 tons.

Petroleum.—The production of crude petroleum decreased from 60,475,516 barrels in 1897 to 55,364,233 barrels in 1898, a loss of 5,111,283 barrels, while the value increased \$3,319,287, from \$40,874,072 in 1897 to \$44,193,359 in 1898, indicating a healthy recovery in 1898 from the depressed prices of the preceding year.

Natural gas.—With the gradual exhaustion of supply, the production of natural gas continues to decrease in amount, but as a result of the higher prices set by producers the value increased from \$13,826,422 to \$15,296,813 in 1898.

STRUCTURAL MATERIALS.

Stone.—The total value of stone of all kinds increased from \$34,667,772 in 1897 to \$36,607,264 in 1898. All kinds of stone participated in this increase except marble, which showed a slight decline from the 1897 figures.

The exports of slate continue to increase in value, rising from \$266,385 in 1896 to \$780,112 in 1897, and \$1,370,075 in 1898.

Clays.—The value of the clays produced and used in 1898 is estimated to be \$10,000,000. This is divided into—brick clays, \$9,000,000; all other clays, including that for pottery, paper manufacture, etc., \$1,000,000. The fact that nearly all brick and tile makers use their own clay makes it extremely difficult to arrive at the value of this raw material. The value of the clay products, including pottery, in 1898 was \$71,597,380 as compared with \$62,359,991 in 1897, an increase of \$9,237,389, or 14.81 per cent.

Cement.—The Portland cement product increased from 2,677,775 barrels in 1897 to 3,692,284 barrels in 1898, a gain of 1,014,509 barrels, or 37.9 per cent. The value increased from \$4,315,891 to \$5,970,773, a gain of 38.34 per cent. Since 1896 the annual increase of production has been more than a million barrels of Portland cement, and the prospects of this increase being continued and even exceeded are good.

The natural rock cement production showed an increase from 8,311,688 barrels in 1897 to 8,418,924 barrels in 1898, while the value increased from \$3,862,392 in 1897 to \$3,888,728 in 1898.

ABRASIVE MATERIALS.

Millstones.—The value of the production in 1898 was almost identical with that of 1897, being \$25,934, as against \$25,932 in the former year.

Grindstones.—This product showed a marked increase, or from \$368,058 in 1897 to \$489,769 in 1898, an increase of \$121,711, or 33 per cent, and the largest product recorded in the last ten years. The value of the production in 1898 was more than twice that of 1895.

Corundum and emery.—The combined product of corundum and emery nearly doubled, increasing from 2,165 short tons in 1897 to 4,064 tons in 1898. The value increased in even greater proportion, or from \$106,574 in 1897 to \$275,064 in 1898. For the three or four years preceding 1898 this product had shown but little change.

Oilstones.—The value of this product increased from \$149,970 in 1897 to \$180,738 in 1898. In 1896 it was \$127,098. This product continues to be almost exclusively under the control of one firm.

Infusorial earth.—The production showed a decline from 3,833 tons, worth \$22,835, in 1897, to 2,733 tons, valued at \$16,691, in 1898. Included in these figures is the product of tripoli from Virginia.

Garnet.—The garnet product in the United States for abrasive purposes increased from 2,554 tons in 1897, worth \$80,853, to 2,967 tons in 1898, valued at \$86,850.

CHEMICAL MATERIALS.

Phosphate rock.—Continuation of the exploitation of the phosphate rock deposits of Tennessee largely increased the production in that State in 1898 as compared with 1897, the totals for the two years being 128,723 long tons in 1897 and 308,107 long tons in 1898. The industry in Florida has grown entirely out of the speculative stage and is now being conducted upon conservative lines. The production in 1898 amounted to 600,894 long tons as compared with 552,342 long tons in 1897. The South Carolina product amounted to 298,610 long tons of land rock and 101,274 long tons of river rock in 1898, against 267,380 long tons of land rock and 90,900 long tons of river rock in 1897. The total product for the United States amounted to 1,308,885 long tons in 1898 as compared with 1,039,345 long tons in 1897. The aggregate value in 1898 amounted to \$3,453,460 against \$2,673,202 in 1897. The average price per ton for all kinds of rock increased from \$2.57 in 1897 to \$2.64 in 1898.

Gypsum.—The total product of gypsum in 1898 was not materially different from that of the preceding year, the output of crude material for the two years being 288,982 short tons in 1897 and 291,638 short tons in 1898. There was a slight decline in value, from \$755,864 in 1897 to \$755,280 in 1898, the decline in value being due principally to the competition for trade in calcined plaster or stucco. In determining the value the product is taken in its first marketable condition, that is to say, the amount sold crude is taken at its value crude. The value of land plaster is given for the ground fertilizer and the value of stucco or calcined plaster is given for the calcined product.

Salt.—The production of salt in the United States was the largest ever obtained, amounting to 17,612,634 barrels of 280 pounds, as compared with 15,973,202 barrels in 1897 and 13,850,726 barrels in 1896, each of these three years having the largest production up to that time. The increased production in 1898 was accompanied by an advance of 15 per cent in prices, the total value increasing from \$4,920,020 in 1897 to \$6,212,554 in 1898. The average price per barrel received by producers in 1898 was 35.3 cents net, the best figure obtained since 1894, when the average price was 36½ cents net per barrel. The principal item of interest in connection with the salt industry in 1898 was the formation of the combination among the producers in the Warsaw district of New York and the active exploitation of the rock salt mines of Louisiana.

Bromine.—This product was practically the same in 1897 and 1898, being 487,149 pounds in the former year and 486,979 pounds in 1898, a decline of only 170 pounds. The value showed a decline from \$129,094 in 1897 to \$126,614 in 1898, a loss of \$2,480.

Borax.—The product was the same in both 1897 and 1898, viz, 16,000,000 pounds. The value, however, was slightly greater in the latter year, or \$1,120,000 as compared with \$1,080,000 in the former year.

Fluorspar.—The production, which showed a decline in 1897 with an output of 5,062 short tons, increased in 1898 to 7,675 tons, surpassing any year since 1893, when the output was 12,400 tons. The value increased in even greater proportion than the product. In 1897 it was \$37,159, while in 1898 it was \$63,050, an increase of \$25,891, or 69.68 per cent. The product increased 2,613 tons, or 51.62 per cent.

Sulphur.—The mines in Louisiana continue idle, and the production in 1898, all of which was from Beaver County, Utah, amounted to 1,200 short tons, valued at \$32,960, as compared with 2,275 short tons, worth \$45,590, in 1897. Prospecting work in the sulphur deposits in Texas continues, but such exploitation work as has been accomplished has not resulted in any marketable product.

Pyrite.—The production of iron pyrite for its sulphur contents in the manufacture of sulphuric acid continues to increase with a demand in 1898 fully up to and at times in excess of the supply. The production amounted in 1898 to 193,364 long tons, worth \$593,801, as compared with 143,201 long tons, valued at \$391,541, in 1897. The displacement of sulphur by the use of iron pyrite in the manufacture of sulphuric acid has shown a remarkable increase in the last few years, the amount of sulphur displaced by pyrite in 1898 being considerably more than double what it was in 1891, seven years before.

PIGMENTS.

Metallic paint.—Exclusive of mortar colors, the amount of hematite iron ore ground and used as pigment in 1898 was 20,972 short tons, valued at \$263,979, against 16,699 short tons, valued at \$187,694, in

1897. The production of mortar color decreased from 8,237 tons in 1897 to 7,107 tons in 1898. The value of the mortar color produced in 1898 was, however, only slightly less than that of the preceding year.

Ocher, umber, and sienna.—The production of ocher in 1898 was 11,963 short tons, a decrease from 14,006 tons in 1897, and the value likewise declined from \$162,764 to \$123,832. Including the production reported as Spanish brown from Maryland, the production of umber in 1897 was 1,080 tons, and in 1898, 1,177 tons. The Spanish brown included in this product amounted to 600 tons in 1897 and 640 tons in 1898; the aggregate value declined from \$11,710 in 1897 to \$8,285 in 1898. The production of sienna increased from 620 to 689 tons, with a slight variation in price.

Venetian red.—The production of this pigment in 1897 was phenomenal, being more than three times that of 1896 and amounting to 13,603 short tons. The output in 1898 was somewhat less, amounting to 10,271 tons, with a decided decline in value induced doubtless by the heavy production of the preceding year.

Zinc white.—The consumption of zinc oxide as a basis for white and colored pigments continues to increase, the amount of this material produced in 1898 being 33,000 short tons, valued at \$2,310,000, against 25,000 short tons worth \$1,750,000 in 1897.

Barytes.—The production of barytes or heavy spar in 1898 was about 20 per cent in excess of that of the preceding year, and amounted to 31,306 short tons, valued at \$108,339. This is the largest production, both in amount and value, since 1892.

White lead.—The production of white lead in oil decreased 4,559,809 pounds, from 157,596,111 pounds in 1897 to 153,036,302 pounds in 1898. The value decreased \$560,000. This decrease was made up by a larger production of dry white lead, the output of which was 39,058,581 pounds in 1898, against 33,720,684 in 1897, a gain of 5,337,897 pounds, but with an increase in value of only \$283,345. The combined product amounted to 192,094,883 pounds in 1898, a net increase of 778,088 pounds over 1897, but with a decrease in the total value of \$276,193. Importations declined 50 per cent.

Red lead.—This mineral includes the red lead used in glass making and in smelting works. The output increased from 15,317,199 pounds, valued at \$731,312, in 1897, to 18,435,016 pounds, worth \$917,521, in 1898. Imports fell off 50 per cent.

Litharge.—Production increased in somewhat larger proportion than that of red lead, from 13,266,322 pounds in 1897 to 18,176,591 pounds in 1898, with a proportionate increase in value. Imports are insignificant and were slightly less in 1898. Litharge used for smelting purposes is included in the production.

Orange mineral.—Production increased from 901,560 pounds, valued at \$55,468, in 1897, to 1,462,715 pounds, worth \$97,873, in 1898, the increase in domestic production taking the place of imported litharge,

the imports showing a decrease of about the same amount, from 1,486,042 pounds to 795,116 pounds.

Cobalt oxide.—The production decreased from 19,520 pounds, valued at \$31,232, in 1897, to 7,848 pounds, worth \$11,772, in 1898.

MISCELLANEOUS.

Fuller's earth.—This mineral is one of the few which showed a decline in 1898, the product in that year being 14,860 short tons, worth \$106,500, as compared with 17,113 short tons in 1897, valued at \$112,272. The product continues to come almost entirely from Florida.

Precious stones.—The value of the product increased from \$130,675 in 1897 to \$160,920 in 1898, an increase of 23.15 per cent. The principal features of the year were the finding of rock crystals in California which almost equal the Japanese and the successful cutting of these, as large as 7 inches in diameter, in this country; the increased output of the Montana sapphires; the continued output of the New Mexico turquoise mines; the finding of tourmalines in Maine and Connecticut; the large increase in imports of diamonds; and the increase in the diamond-cutting industry in the United States.

Mica.—The sheet-mica product continued to increase, rising from 82,676 pounds in 1897 to 129,520 pounds, a gain of 56.66 per cent in 1898, which is the largest product since 1885. The value increased, though not in the same proportion as the product. It rose from \$80,774 in 1897 to \$103,534—\$22,760—or 28.18 per cent. In addition there were sold 3,999 tons of scrap mica for use in the manufacture of lubricants, wall papers, boiler coverings, etc., valued at \$27,564, as compared with 740 tons in 1897, valued at \$14,452.

Feldspar.—This showed a slight gain, or from 11,175 long tons in 1897 to 12,000 tons in 1898, while the value declined from \$43,100 in 1897 to \$32,395 in 1898.

Flint.—This is chiefly ground quartz. The product increased from 11,952 long tons in 1897 to 19,130 long tons in 1898, or 60 per cent. The value increased from \$26,227 in 1897 to \$42,670 in 1898, a gain of \$16,443, or 62.7 per cent.

Asphaltum.—Under the general head of asphaltum is included the numerous varieties of bitumens or hydrocarbons occurring in the United States and which are not discussed in connection with petroleum. These varieties include the hard and liquid asphaltum and the sandstone and limestone impregnated with bitumen, commonly known as bituminous sandstone and bituminous limestone, or bituminous rock. The aggregate product of the several varieties in 1898 amounted to 76,337 short tons—an increase of 392 tons from the 75,945 tons produced in 1897. The value also increased from \$664,632 in 1897 to \$675,649 in 1898. The value of the product in 1898 was the largest ever recorded. There were two other years—1892 and 1896—when the amount of the product exceeded that of 1898.

Asbestos.—The production was in both 1897 and 1898 limited to two States—California and Georgia—and, considered with the domestic consumption, is insignificant. The total production in 1898 amounted to 605 short tons as against 580 short tons in 1897. The value of the production in 1898 was \$10,300, and in 1897, \$6,450. The value of the asbestos imported into the United States, most of which was from Black Lake and Thetford, in Canada, amounted in 1897 to \$268,264, and in 1898 to \$300,533.

Graphite.—The production of crystalline graphite in 1898 amounted to 2,360,000 pounds in its first marketable condition, and the amount of amorphous graphite and graphitic coal was 890 short tons, these figures being against 1,254,402 pounds and 1,108 short tons in 1897. The aggregate value of the production in 1898 was \$75,200, as against \$54,277 in 1897.

Soapstone.—The industry in 1898 was marked by a slight increase in production and a decided decrease in value. The output amounted to 22,231 short tons in 1898, valued at \$287,112, as against 21,923 short tons in 1897, valued at \$365,629. The production has not varied materially within the last six years, having ranged during this time between 21,071 and 23,144 tons, a difference of less than 10 per cent. The value has varied from \$255,067 to \$401,325, each year showing considerable fluctuations, this being due principally to the condition in which the material was sold, the values being placed upon it in its first marketable condition.

Magnesite.—This made proportionately quite an advance in value, from \$13,671 in 1897 to \$19,075, or \$5,404, or about 40 per cent. The quantity produced increased from 1,143 short tons to 1,263 tons, a gain of 120 tons, or about 10.5 per cent. This product, as heretofore, comes entirely from California.

Mineral waters.—These showed an increase from 23,255,911 gallons sold in 1897, valued at \$4,599,106, to its maximum quantity and value in 1898 of 28,853,464 gallons sold, worth \$8,051,833. This is an increase of 5,597,553 gallons, or about 24 per cent, while the value increased \$3,546,213, or 75.07 per cent.

Limestone for iron flux.—This product naturally increased with the iron product and rose from 4,247,688 long tons in 1897, valued at \$2,124,000, to 5,275,819 tons in 1898, worth \$2,638,000. This is an increase of 24.20 per cent in both product and value.

Bauxite.—The product in 1898 was 25,149 long tons, worth \$75,437, as compared with 20,590 long tons in 1897, valued at \$57,652, an increase of 4,559 tons and \$17,785 over 1897, or of about 22 per cent in quantity and 31 per cent in value.

Monazite.—This product made the largest proportionate gain, or from 44,000 pounds in 1897 to 250,776 pounds in 1898, an increase of 470 per cent, while the value rose from \$1,980 in 1897 to \$13,542 in 1898, a gain of 584 per cent.

Mineral products of the United

		1897.	
Products.		Quantity.	Value.
METALLIC.			
1	Pig iron (spot value)	long tons..	9,652,680
2	Silver, coining value.....	troy ounces..	53,860,000
3	Gold, coining value.....	do.....	2,774,935
4	Copper, value at New York City.....	pounds..	494,078,274
5	Lead, value at New York City.....	short tons..	212,000
6	Zinc, value at New York City.....	do.....	99,980
7	Quicksilver, value at San Francisco.....	flasks..	26,648
8	Aluminum, value at Pittsburg.....	pounds..	4,000,000
9	Antimony, value at San Francisco.....	short tons..	756
10	Nickel, value at Philadelphia.....	pounds..	23,707
11	Tin.....	do.....	None.
12	Platinum, value (crude) at San Francisco.....	troy ounces..	150
13	Total value of metallic products		302,198,502
NONMETALLIC (SPOT VALUES).			
14	Bituminous coal	short tons..	147,609,985
15	Pennsylvania anthracite.....	long tons..	46,974,714
16	Stone.....	do.....	
17	Petroleum.....	barrels..	60,475,516
18	Natural gas.....	do.....	
19	Brick clay.....	do.....	
20	Clay (all other than brick).....	do.....	
21	Cement.....	barrels..	10,989,463
22	Mineral waters.....	gallons sold..	23,255,911
23	Phosphate rock.....	long tons..	1,039,345
24	Salt.....	barrels..	15,973,202
25	Limestone for iron flux.....	long tons..	247,688
26	Zinc white.....	short tons..	25,000
27	Gypsum.....	do.....	288,982
28	Borax.....	pounds..	16,000,000
29	Mineral paints.....	short tons..	60,913
30	Grindstones.....	do.....	
31	Fibrous talc.....	short tons..	57,009
32	Asphaltum.....	do.....	75,945
33	Soapstone.....	do.....	21,923
34	Precious stones.....	do.....	
35	Pyrite.....	long tons..	143,201
36	Corundum and emery.....	short tons..	2,165
37	Oilstones, etc.....	do.....	
38	Garnet for abrasive purposes.....	short tons..	2,554
39	Mica.....	(sheet, pounds..	82,676
		(scrap, tons..	740
40	Barytes (crude)	short tons..	26,042
41	Bromine.....	pounds..	487,149
42	Fluorspar.....	short tons..	5,062
43	Feldspar.....	long tons..	11,175
44	Manganese ore.....	do.....	11,108
45	Flint.....	do.....	11,952
46	Monasite.....	pounds..	44,000
47	Graphite.....	(crystalline, lbs..	1,254,402
		(amorphous, tons..	1,108
48	Bauxite.....	long tons..	20,590
49	Sulphur.....	short tons..	2,275
50	Fuller's earth.....	do.....	17,113
51	Marls.....	do.....	60,000
52	Infusorial earth and tripoli.....	do.....	3,833
53	Pumice stone.....	do.....	158
54	Millstones.....	do.....	
55	Chromic iron ore.....	long tons..	None.
56	Cobalt oxide.....	pounds..	19,520
57	Magnesite.....	short tons..	1,143
58	Asbestos.....	do.....	580
59	Rutile.....	pounds..	100
60	Ozocerite, refined.....	do.....	None.
61	Total value of nonmetallic mineral products		327,655,427
62	Total value of metallic products		302,198,502
63	Estimated value of mineral products unspecified.....		1,000,000
64	Grand total.....		630,853,929

SUMMARY.

17

States in 1897 and 1898.

1896.		Increase or decrease in 1896.		Per cent of increase or decrease.		
Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	
11,773,934	\$116,557,000	+ 2,121,254	+ \$21,434,701	21.97	22.53	1
54,438,000	70,384,485	+ 578,000	+ 747,313	1.07	1.07	2
3,118,398	64,463,000	+ 848,463	+ 7,100,000	12.38	12.38	3
526,512,987	61,865,276	+ 32,434,713	+ 7,785,096	6.56	14.40	4
222,000	16,650,000	+ 10,000	+ 1,764,272	4.72	11.85	5
115,399	10,385,910	+ 15,419	+ 1,887,610	15.42	22.21	6
31,092	1,188,627	+ 4,444	+ 195,182	16.67	19.65	7
5,200,000	1,716,000	+ 1,200,000	+ 216,000	30	14.40	8
1,120	184,050	+ 364	+ 74,395	48.15	67.84	9
13,411	4,694	- 10,296	- 3,129	43.43	40	10
None.						11
225	1,913	+ 75	+ 1,013	50	112.56	12
	343,400,955		+ 41,202,453		13.63	13
166,592,023	132,596,313	+ 18,962,038	+ 13,019,069	12.86	10.89	14
47,663,075	75,414,537	+ 688,361	- 3,887,417	+ 1.47	- 4.90	15
	38,607,264		+ 1,939,492		5.59	16
55,364,233	44,193,359	- 5,111,283	+ 3,319,287	- 8.45	+ 8.12	17
	15,296,813		+ 1,470,391		10.61	18
	9,000,000		+ 1,000,000		12.50	19
	1,000,000					20
12,111,208	9,859,501	+ 1,121,745	+ 1,681,218	10.21	20.56	21
28,853,464	8,051,833	+ 5,597,553	+ 3,546,213	24.07	75.07	22
1,308,885	3,453,480	+ 269,540	+ 780,258	25.93	29.19	23
17,612,634	6,212,554	+ 1,639,432	+ 1,292,534	10.26	26.27	24
5,275,819	2,638,000	+ 1,028,131	+ 514,000	24.20	24.20	25
33,000	2,310,000	+ 8,000	+ 560,000	82	82	26
291,638	755,280	+ 2,656	- 584	+ 0.92	- 0.08	27
16,600,000	1,120,000		+ 40,000		3.70	28
58,850	694,856	- 2,063	- 100,937	3.39	12.68	29
	489,769		+ 121,711		38.07	30
54,356	411,430	- 2,653	+ 14,801	- 4.88	+ 3.73	31
76,337	675,649	+ 392	+ 11,017	0.52	1.66	32
22,231	287,112	+ 306	- 78,517	+ 1.40	- 21.47	33
	160,920		+ 30,245		23.15	34
193,364	593,801	+ 50,163	+ 202,260	35.03	51.66	35
4,064	275,064	+ 1,899	+ 168,490	87.71	158.10	36
	180,738		+ 80,768		20.52	37
2,967	86,850	+ 413	+ 5,997	16.17	7.42	38
129,520	103,534	+ 46,844	+ 23,760	56.66	28.18	39
3,999	27,564	+ 3,250	+ 13,112	440.41	90.73	40
31,306	106,339	+ 5,264	+ 50,044	20.21	85.84	41
486,979	120,614	+ 170	- 2,480	0.03	1.91	42
7,675	63,050	+ 2,613	+ 25,891	51.62	69.68	43
12,000	32,895	+ 825	- 10,705	+ 7.38	- 24.84	44
15,957	129,185	+ 4,849	+ 33,680	43.65	35.27	45
19,130	42,670	+ 7,178	+ 16,448	60.05	62.69	46
250,776	13,542	+ 206,776	+ 11,562	469.95	583.94	47
2,380,000	75,200	+ 1,105,598	+ 20,923	+ 88.14	+ 88.55	48
890	75,437	+ 218	+ 17,785	- 24.49	30.85	49
25,149	32,980	+ 4,559	- 12,630	22.14	27.70	50
1,200	106,500	- 1,075	- 5,772	47.25	5.14	51
14,890	80,000	- 2,253		13.17		52
60,000	16,691	- 1,100	- 6,144	28.70	28.91	53
2,733	13,200	+ 442	+ 13,200	279.75		54
600	25,934		+ 2		0.01	55
None.	None.					56
7,848	11,772	- 11,673	- 19,460	59.80	62.31	57
1,263	19,075	+ 120	+ 5,404	10.50	39.53	58
605	10,300	+ 25	+ 3,850	4.31	59.69	59
140	700	+ 40	+ 350	40	100	60
None.	None.					61
	353,419,765		+ 25,764,338		7.87	62
	343,400,955		+ 41,202,453		13.63	63
	1,000,000					64
	697,820,720		+ 66,966,791		10.62	65

Mineral products of the United States

Product.		1880.	
		Quantity.	Value.
METALLIC.			
1	Pig iron, value at Philadelphia long tons..	3, 375, 912	\$89, 315, 569
2	Silver, coining value troy ounces..	30, 320, 000	39, 200, 000
3	Gold, coining value do.....	1, 741, 500	36, 000, 000
4	Copper, value at New York City pounds..	60, 480, 000	11, 491, 200
5	Lead, value at New York City short tons..	97, 825	9, 782, 500
6	Zinc, value at New York City do.....	23, 239	2, 277, 432
7	Quicksilver, value at San Francisco..... flasks..	59, 926	1, 797, 780
8	Nickel, value at Philadelphia pounds..	329, 968	164, 984
9	Aluminum, value at Pittsburg..... do.....		
10	Antimony, value at San Francisco..... short tons..	50	10, 000
11	Platinum (crude), value at San Francisco, troy ounces.....	100	400
12	Total value of metallic products.....		190, 039, 865
NONMETALLIC (spot values).			
13	Bituminous coal..... long tons..	38, 242, 641	53, 443, 718
14	Pennsylvania anthracite..... do.....	25, 580, 189	42, 196, 678
15	Stone..... do.....		18, 356, 055
16	Petroleum..... barrels..	26, 286, 123	24, 183, 233
17	Lime..... do.....	28, 000, 000	19, 000, 000
18	Natural gas.....		
19	Cement..... barrels..	2, 072, 943	1, 852, 707
20	Salt..... do.....	5, 961, 060	4, 829, 566
21	Phosphate rock..... long tons..	211, 377	1, 123, 823
22	Limestone for iron flux..... do.....	4, 500, 000	3, 800, 000
23	Mineral waters..... gallons sold..	2, 000, 000	500, 000
24	Zinc white..... short tons..	10, 107	763, 738
25	Potters' clay..... long tons..	25, 783	200, 457
26	Mineral paints..... short tons..	3, 604	135, 840
27	Borax..... pounds..	3, 692, 443	277, 233
28	Gypsum..... short tons..	90, 000	400, 000
29	Grindstones.....		500, 000
30	Fibrous talc..... short tons..	4, 210	54, 730
31	Pyrites..... long tons..	2, 000	5, 000
32	Soapstone..... short tons..	8, 441	66, 665
33	Manganese ore..... long tons..	5, 761	86, 415
34	Asphaltum..... short tons..	444	4, 440
35	Precious stones.....		100, 000
36	Bromine..... pounds..	404, 690	114, 752
37	Corundum..... short tons..	1, 044	29, 280
38	Barytes (crude)..... do.....	20, 000	80, 000
39	Graphite..... pounds..		49, 800
40	Millstones.....		200, 000
41	Oilstones, etc. a..... pounds..	420, 000	8, 000
42	Marls..... short tons..	1, 000, 000	500, 000
43	Flint..... long tons..	20, 000	80, 000
44	Fluorspar..... short tons..	4, 000	16, 000
45	Chromic iron ore..... long tons..	2, 288	27, 808
46	Infusorial earth..... short tons..	1, 833	45, 660
47	Feldspar..... long tons..	12, 500	60, 000
48	Mica..... pounds..	81, 669	127, 825
49	Cobalt oxide..... do.....	7, 251	24, 000
50	Slate ground as a pigment..... short tons..	1, 000	10, 000
51	Sulphur..... do.....	600	21, 000
52	Asbestos..... do.....	150	4, 312
53	Rutile..... pounds..	100	400
54	Lithographic stone..... short tons..		
55	Total value of nonmetallic mineral products.....		173, 279, 135
56	Total value of metallic products.....		190, 039, 865
57	Estimated value of mineral products unspecified.....		6, 000, 000
58	Grand total.....		369, 319, 000

a Prior to 1889, quantity and value are for rough stone quarried; since 1889 they are for finished product.

SUMMARY.

19

for the calendar years 1880 to 1886.

1881.		1882.		1883.		
Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	
4, 144, 254	\$87, 029, 334	4, 623, 323	\$106, 336, 429	4, 595, 510	\$91, 910, 200	1
33, 077, 000	43, 000, 000	36, 197, 695	46, 800, 000	35, 733, 622	46, 200, 000	2
1, 676, 300	34, 700, 000	1, 572, 186	32, 500, 000	1, 451, 249	30, 000, 000	3
71, 680, 000	12, 175, 600	91, 646, 232	16, 038, 091	117, 151, 795	18, 064, 807	4
117, 085	11, 240, 160	132, 890	12, 624, 550	143, 957	12, 322, 719	5
26, 800	2, 680, 000	33, 765	3, 646, 620	36, 872	3, 311, 106	6
60, 851	1, 764, 679	52, 732	1, 487, 042	46, 725	1, 253, 632	7
265, 668	292, 235	281, 616	309, 777	58, 800	52, 920	8
				83	875	9
50	10, 000	60	12, 000	60	12, 000	10
100	400	200	600	200	600	11
	192, 892, 408		219, 755, 109		203, 128, 859	12
48, 179, 475	60, 224, 344	60, 861, 190	76, 076, 487	68, 531, 500	82, 237, 800	13
28, 500, 016	64, 125, 036	31, 358, 264	70, 556, 094	34, 336, 469	77, 257, 055	14
	20, 000, 000		21, 000, 000		20, 000, 000	15
27, 661, 238	25, 448, 339	30, 510, 830	24, 065, 988	23, 449, 633	25, 790, 252	16
30, 000, 000	20, 000, 000	31, 000, 000	21, 700, 000	32, 000, 000	19, 200, 000	17
			215, 000		475, 000	18
2, 500, 000	2, 000, 000	3, 250, 000	3, 672, 750	4, 190, 000	4, 293, 500	19
6, 200, 000	4, 200, 000	6, 412, 373	4, 320, 140	6, 192, 231	4, 211, 042	20
266, 734	1, 980, 259	332, 077	1, 992, 462	378, 380	2, 270, 280	21
6, 000, 000	4, 100, 000	3, 850, 000	2, 310, 000	3, 814, 273	1, 907, 136	22
3, 700, 000	700, 000	5, 000, 000	800, 000	7, 529, 423	1, 119, 603	23
10, 000	700, 000	10, 000	700, 000	12, 000	840, 000	24
25, 000	200, 000	30, 000	240, 000	32, 000	250, 000	25
6, 000	100, 000	7, 000	105, 000	7, 000	84, 000	26
4, 046, 000	304, 461	4, 236, 291	338, 943	6, 500, 000	585, 000	27
85, 000	350, 000	100, 000	450, 000	90, 000	420, 000	28
	500, 000		700, 000		600, 000	29
5, 000	60, 000	6, 000	75, 000	6, 000	75, 000	30
10, 000	60, 000	12, 000	72, 000	25, 000	137, 500	31
7, 000	75, 000	6, 000	90, 000	8, 000	150, 000	32
4, 895	73, 425	4, 532	67, 980	6, 155	92, 325	33
2, 000	8, 000	3, 000	10, 500	3, 000	10, 500	34
	110, 000		150, 000		207, 050	35
300, 000	75, 000	250, 000	75, 000	301, 100	72, 264	36
500	80, 000	500	80, 000	550	100, 000	37
20, 000	80, 000	20, 000	80, 000	27, 000	108, 000	38
400, 000	30, 000	425, 000	34, 000	575, 000	46, 000	39
	150, 000		200, 000		150, 000	40
500, 000	8, 580	600, 000	10, 000	600, 000	10, 000	41
1, 000, 000	500, 000	1, 080, 000	540, 000	972, 000	486, 000	42
25, 000	100, 000	25, 000	100, 000	25, 000	100, 000	43
4, 000	16, 000	4, 000	20, 000	4, 000	20, 000	44
2, 000	30, 000	2, 500	50, 000	3, 000	60, 000	45
1, 000	10, 000	1, 000	8, 000	1, 000	5, 000	46
11, 000	70, 000	14, 000	70, 000	14, 100	71, 112	47
100, 000	250, 000	100, 000	250, 000	114, 000	285, 000	48
8, 280	25, 000	11, 653	32, 046	1, 096	2, 795	49
1, 000	10, 000	2, 000	24, 000	2, 000	24, 000	50
600	21, 000	600	21, 000	1, 000	27, 000	51
200	7, 000	1, 200	36, 000	1, 000	30, 000	52
200	700	500	1, 800	550	2, 000	53
50	1, 000					54
	206, 783, 144		231, 340, 150		243, 812, 214	55
	192, 892, 408		219, 755, 109		203, 128, 859	56
	6, 500, 000		6, 500, 000		6, 500, 000	57
	406, 175, 552		457, 595, 259		453, 441, 073	58

Mineral products of the United States for

		1884.	
Product.		Quantity.	Value.
METALLIC.			
1	Pig iron, value at Philadelphia.....long tons	4, 097, 868	\$73, 761, 624
2	Silver, coining value.....troy ounces	37, 744, 605	48, 800, 000
3	Gold, coining value.....do	1, 489, 949	30, 800, 000
4	Copper, value at New York City.....pounds	145, 221, 934	17, 789, 687
5	Lead, value at New York City.....short tons	139, 897	10, 537, 042
6	Zinc, value at New York City.....do	38, 544	3, 422, 707
7	Quicksilver, value at San Francisco.....flasks	31, 913	936, 327
8	Nickel, value at Philadelphia.....pounds	64, 550	48, 412
9	Aluminum, value at Pittsburg.....do	150	1, 350
10	Antimony, value at San Francisco.....short tons	60	12, 000
11	Platinum (crude), value at San Francisco, troy ounces	150	450
12	Total value of metallic products.....		186, 109, 599
NONMETALLIC (spot values).			
13	Bituminous coal.....long tons	73, 730, 539	77, 417, 066
14	Pennsylvania anthracite.....do	33, 175, 756	66, 351, 512
15	Stone.....do		19, 000, 000
16	Petroleum.....barrels	24, 218, 438	20, 595, 966
17	Lime.....do	37, 000, 000	18, 500, 000
18	Natural gas.....		1, 460, 000
19	Brick clay.....		
20	Clay (all other than brick).....long tons	35, 000	270, 000
21	Cement.....barrels	4, 000, 000	3, 720, 000
22	Salt.....do	6, 514, 937	4, 197, 734
23	Phosphate rock.....long tons	431, 779	2, 374, 784
24	Limestone for iron flux.....do	3, 401, 930	1, 700, 965
25	Mineral waters.....gallons sold	10, 215, 328	1, 459, 143
26	Zinc white.....short tons	13, 000	910, 000
27	Mineral paints.....do	7, 000	84, 000
28	Borax.....pounds	7, 000, 000	490, 000
29	Gypsum.....short tons	90, 000	390, 000
30	Grindstones.....		570, 000
31	Fibrous talc.....short tons	10, 000	110, 000
32	Pyrites.....long tons	35, 000	175, 000
33	Soapstone.....short tons	10, 000	200, 000
34	Manganese ore.....long tons	10, 180	122, 160
35	Asphaltum.....short tons	3, 000	10, 500
36	Precious stones.....		222, 975
37	Bromine.....pounds	281, 100	67, 464
38	Corundum.....short tons	600	108, 000
39	Barytes (crude).....do	25, 000	100, 000
40	Graphite.....pounds		
41	Millstones.....		150, 000
42	Oilstones, etc. a.....pounds	800, 000	12, 000
43	Marls.....short tons	875, 000	437, 500
44	Flint.....long tons	30, 000	120, 000
45	Fluorspar.....short tons	4, 000	20, 000
46	Chromic iron ore.....long tons	2, 000	35, 000
47	Infusorial earth.....short tons	1, 000	5, 000
48	Feldspar.....long tons	10, 900	55, 112
49	Mica.....pounds	147, 410	368, 525
50	Cobalt oxide.....do	2, 000	5, 100
51	Slate ground as a pigment.....short tons	2, 000	20, 000
52	Sulphur.....do	500	12, 000
53	Asbestos.....do	1, 000	30, 000
54	Rutile.....pounds	600	2, 000
55	Lithographic stone.....short tons		
56	Total value of nonmetallic mineral products.....		221, 879, 506
57	Total value of metallic products.....		186, 109, 599
58	Estimated value of mineral products unspecified.....		5, 000, 000
59	Grand total.....		412, 989, 105

a Prior to 1889, quantity and value are for rough stone quarried; since 1890 they are for finished product.

SUMMARY.

21

the calendar years 1880 to 1896—Continued.

1885.		1886.		1887.		
Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	
4,044,425	\$64,712,400	5,683,329	\$95,195,760	6,417,148	\$121,925,800	1
39,910,279	51,600,000	39,445,312	51,000,000	41,269,240	53,350,000	2
1,538,376	31,800,000	1,881,250	35,000,000	1,596,500	33,000,000	3
170,962,607	18,292,999	161,235,381	16,527,651	185,227,331	21,115,916	4
129,412	10,469,431	130,629	12,200,749	145,700	13,113,000	5
40,688	3,539,856	42,641	3,752,408	50,340	4,782,300	6
32,073	979,189	29,981	1,060,000	33,825	1,429,000	7
277,904	179,975	214,992	127,157	205,566	133,200	8
283	2,550	3,000	27,000	18,000	59,000	9
50	10,000	35	7,000	75	15,000	10
250	187	50	100	448	1,838	11
-----	181,586,587	-----	214,897,825	-----	248,925,054	12
64,840,668	82,347,648	73,707,957	78,481,056	87,887,360	98,004,656	13
34,228,548	76,671,948	34,853,077	76,119,120	37,578,747	84,552,181	14
-----	19,000,000	-----	19,000,000	-----	25,000,000	15
21,847,205	19,198,243	28,064,841	19,996,313	28,278,806	18,877,094	16
40,000,000	20,000,000	-----	-----	-----	-----	17
-----	4,857,200	-----	10,012,000	-----	15,817,500	18
-----	-----	-----	6,200,000	-----	7,000,000	19
36,000	275,000	40,000	325,000	43,000	340,000	20
4,150,000	3,492,500	4,500,000	3,990,000	6,692,744	5,674,377	21
7,038,653	4,825,345	7,707,081	4,736,585	7,831,962	4,093,846	22
437,856	2,846,064	430,549	1,872,936	480,558	1,836,818	23
3,356,956	1,678,478	4,717,163	2,830,297	5,377,000	3,226,200	24
9,148,401	1,312,845	8,950,317	1,284,070	8,259,609	1,261,463	25
15,000	1,050,000	18,000	1,440,000	18,000	1,440,000	26
3,950	43,575	18,800	315,000	22,000	330,000	27
8,000,000	480,000	9,778,290	488,915	11,000,000	550,000	28
90,405	405,000	95,250	428,625	95,000	425,000	29
-----	500,000	-----	250,000	-----	224,400	30
10,000	110,000	12,000	125,000	15,000	160,000	31
49,000	220,500	55,000	220,000	52,000	210,000	32
10,000	200,000	12,000	225,000	12,000	225,000	33
23,258	190,281	30,193	277,636	34,524	333,844	34
3,000	10,500	3,500	14,000	4,000	16,000	35
-----	209,900	-----	119,056	-----	163,600	36
310,000	89,900	428,334	141,350	199,087	61,717	37
600	108,000	645	116,190	600	108,000	38
15,000	75,000	10,000	50,000	15,000	75,000	39
327,883	26,231	415,525	33,242	416,000	34,000	40
-----	100,000	-----	140,000	-----	100,000	41
1,000,000	15,000	1,160,000	15,000	1,200,000	16,000	42
875,000	437,500	800,000	400,000	600,000	300,000	43
30,000	120,000	30,000	120,000	32,000	128,000	44
5,000	22,500	5,000	22,000	5,000	20,000	45
2,700	40,000	2,000	30,000	3,000	40,000	46
1,000	5,000	1,200	6,000	3,000	15,000	47
13,600	68,000	14,900	74,500	10,200	61,200	48
92,000	161,000	40,000	70,000	70,000	142,250	49
68,723	65,373	35,000	36,878	18,340	18,774	50
1,975	24,687	-----	-----	-----	-----	51
715	17,875	2,500	75,000	3,000	100,000	52
300	9,000	200	6,000	150	4,500	53
600	2,000	600	2,000	1,000	3,000	54
-----	-----	-----	-----	-----	-----	55
-----	241,312,093	-----	230,088,769	-----	270,989,420	56
-----	181,586,587	-----	214,897,825	-----	248,925,054	57
-----	5,000,000	-----	800,000	-----	800,000	58
-----	427,898,680	-----	445,786,594	-----	520,714,474	59

Mineral products of the United States

		1888.	
Product.		Quantity.	Value.
METALLIC.			
1	Pig iron, value at Philadelphia .....long tons..	6,489,738	\$107,000,000
2	Silver, coining value .....troy ounces..	45,783,632	59,195,000
3	Gold, coining value.....do.....	1,604,927	33,175,000
4	Copper, value at New York City .....pounds..	231,270,622	33,833,951
5	Lead, value at New York City.....short tons..	151,919	13,399,256
6	Zinc, value at New York City.....do.....	55,903	5,500,855
7	Quicksilver, value at San Francisco.....flasks..	33,250	4,113,125
8	Aluminum, value at Pittsburg.....pounds..	19,000	65,000
9	Antimony, value at San Francisco.....short tons..	100	20,000
10	Nickel, value at Philadelphia .....pounds..	204,328	127,632
11	Tin.....do.....		
12	Platinum (crude), value at San Francisco, troy ounces.....	500	2,000
13	Total value of metallic products.....		253,731,822
NONMETALLIC (spot values).			
14	Bituminous coal.....short tons..	102,039,838	101,860,529
15	Pennsylvania anthracite.....long tons..	41,624,611	89,020,483
16	Stone.....		25,500,000
17	Petroleum.....barrels..	27,612,025	17,947,620
18	Natural gas.....		22,629,875
19	Brick clay.....		7,500,000
20	Clay (all other than brick).....long tons..	36,750	300,000
21	Cement.....barrels..	6,503,295	5,021,139
22	Mineral waters.....gallons sold..	9,578,648	1,679,302
23	Phosphate rock.....long tons..	448,567	2,018,552
24	Salt.....barrels..	8,055,881	4,374,203
25	Limestone for iron flux.....long tons..	5,438,000	2,719,000
26	Zinc white.....short tons..	20,000	1,600,000
27	Gypsum.....do.....	110,000	550,000
28	Borax.....pounds..	7,589,000	455,340
29	Mineral paints.....short tons..	26,500	405,000
30	Grindstones.....		281,800
31	Fibrous talc.....short tons..	20,000	210,000
32	Asphaltum.....do.....	53,800	331,500
33	Soapstone.....do.....	15,000	250,000
34	Precious stones.....		139,850
35	Pyrites.....long tons..	54,331	167,658
36	Corundum.....short tons..	589	91,620
37	Oilstones, etc. a.....pounds..	1,500,000	18,000
38	Mica.....do.....	48,000	70,000
39	Barytes (crude).....short tons..	20,000	110,000
40	Bromine.....pounds..	307,386	95,290
41	Fluorspar.....short tons..	6,000	30,000
42	Feldspar.....long tons..	8,700	50,000
43	Manganese ore.....do.....	29,198	279,571
44	Flint.....do.....	30,000	127,500
45	Graphite.....pounds..	400,000	33,000
46	Bauxite.....long tons..		
47	Sulphur.....short tons..		
48	Marls.....do.....	300,000	150,000
49	Infusorial earth.....do.....	1,500	7,500
50	Millstones.....		81,000
51	Chromic iron ore.....long tons..	1,500	20,000
52	Cobalt oxide.....pounds..	8,491	15,782
53	Magnesite.....short tons..		
54	Asbestos.....do.....	100	3,000
55	Rutile.....pounds..	1,000	3,000
56	Ozocerite (refined).....do.....	43,500	3,000
57	Total value of nonmetallic mineral products.....		286,150,114
58	Total value of metallic products.....		253,731,822
59	Estimated value of mineral products unspecified.....		900,000
60	Grand total.....		540,781,936

a Prior to 1889, quantity and value are for rough stone quarried; since 1890 they are for finished product.

SUMMARY.

23

for the calendar years 1880 to 1896—Continued.

1880.		1890.		1891.		
Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	
7,603,642	\$120,000,000	9,202,703	\$151,200,410	8,279,870	\$128,337,985	1
51,354,851	66,396,988	54,500,000	70,464,645	58,330,000	75,416,565	2
1,590,869	32,886,744	1,588,880	32,845,000	1,604,840	33,175,000	3
231,246,214	26,907,809	265,115,133	30,848,797	295,812,076	38,455,300	4
156,397	13,794,235	143,630	12,668,166	178,554	15,534,198	5
58,860	5,791,824	63,683	6,266,407	80,873	8,033,700	6
26,484	1,190,500	22,926	1,203,615	22,904	1,036,386	7
47,468	97,335	61,281	61,281	150,000	100,000	8
115	28,000	129	40,756	278	47,007	9
262,663	151,598	223,488	134,093	118,498	71,099	10
				125,289	25,058	11
500	2,000	600	2,500	100	500	12
	267,247,033		305,735,670		300,232,798	13
95,685,543	94,504,745	111,320,016	110,420,801	117,901,237	117,188,400	14
40,714,721	66,879,514	41,489,858	66,383,772	45,236,992	73,944,735	15
	42,809,706		47,000,000		47,294,746	16
35,163,513	26,963,340	45,822,672	35,365,105	54,291,980	30,526,553	17
	21,097,099		18,742,725		15,500,084	18
	8,000,000		8,500,000		9,000,000	19
294,344	635,578	350,000	756,000	400,000	900,000	20
7,000,000	5,000,000	8,000,000	6,000,000	8,222,792	6,680,951	21
12,780,471	1,748,458	13,907,418	2,600,750	18,392,732	2,996,259	22
550,245	2,937,776	510,499	3,213,795	587,988	3,651,150	23
8,005,565	4,195,412	8,776,991	4,752,286	9,987,945	4,716,121	24
6,318,000	3,159,000	5,521,623	2,760,811	5,000,000	2,300,000	25
16,970	1,357,600		1,600,000		1,600,000	26
267,769	764,118	182,995	574,523	208,126	628,051	27
8,000,000	500,000	9,500,000	617,500	13,380,000	869,700	28
34,307	483,766	47,732	681,992	49,652	678,478	29
	439,587		450,000		476,113	30
23,746	241,170	41,354	389,196	53,054	493,068	31
51,735	171,537	40,841	190,416	45,054	242,264	32
12,715	231,708	13,670	252,309	16,514	243,981	33
	188,807		118,833		235,300	34
93,705	202,119	99,854	273,745	106,536	338,880	35
2,245	105,565	1,970	89,395	2,265	90,230	36
5,982,000	32,980		69,909	1,375,000	150,000	37
49,500	50,000	60,000	75,000	75,000	100,000	38
19,161	106,313	21,911	86,505	31,069	118,363	39
418,891	125,647	387,847	104,719	343,000	54,880	40
8,500	45,835	8,250	55,328	10,044	78,330	41
6,970	39,370	8,000	45,200	10,000	50,000	42
24,197	240,559	25,684	219,050	23,416	239,129	43
21,113	89,730	13,000	57,400	15,000	60,000	44
	72,662		77,500		110,000	45
728	2,366	1,844	6,012	3,593	11,675	46
1,150	7,850			1,200	39,600	47
139,522	63,956	153,620	69,880	135,000	67,500	48
3,466	23,372	2,532	50,240		21,988	49
	35,155		23,720		16,587	50
2,000	30,000	3,599	53,985	1,372	20,580	51
13,955	31,092	6,788	16,291	7,200	18,000	52
				439	4,390	53
30	1,800	71	4,560	66	3,960	54
1,000	3,000	400	1,000	300	800	55
50,000	2,500	350,000	26,250	50,000	7,000	56
	282,623,812		312,776,503		321,767,846	57
	267,247,033		305,735,670		300,232,798	58
	1,000,000		1,000,000		1,000,000	59
	550,870,845		619,512,173		623,000,644	60

Mineral products of the United States

Product.		1892.	
		Quantity.	Value.
METALLIC.			
1	Pig iron, value at Philadelphia.....long tons..	9, 157, 000	\$131, 161, 039
2	Silver, coining value.....troy ounces..	63, 500, 000	82, 099, 150
3	Gold, coining value.....do.....	1, 596, 375	33, 000, 000
4	Copper, value at New York City.....pounds..	352, 971, 744	37, 977, 142
5	Lead, value at New York City.....short tons..	173, 654	13, 892, 320
6	Zinc, value at New York City.....do.....	87, 260	8, 027, 920
7	Quicksilver, value at San Francisco.....flasks..	27, 993	1, 245, 689
8	Aluminum, value at Pittsburg.....pounds..	259, 885	172, 824
9	Antimony, value at San Francisco.....short tons..	.....	56, 466
10	Nickel, value at Philadelphia.....pounds..	92, 252	50, 739
11	Tin.....do.....	182, 000	32, 400
12	Platinum (crude), value at San Francisco, troy ounces.....	80	550
13	Total value of metallic products.....	.....	307, 716, 239
NONMETALLIC (spot values).			
14	Bituminous coal.....short tons..	126, 856, 567	125, 124, 381
15	Pennsylvania anthracite.....long tons..	46, 850, 450	82, 442, 000
16	Stone.....do.....	.....	48, 706, 625
17	Petroleum.....barrels..	50, 509, 136	26, 034, 196
18	Natural gas.....do.....	.....	14, 800, 714
19	Brick clay.....do.....	.....	9, 000, 000
20	Clay (all other than brick).....long tons..	420, 000	1, 000, 000
21	Cement.....barrels..	8, 758, 621	7, 152, 750
22	Mineral waters.....gallons sold..	21, 876, 604	4, 905, 970
23	Phosphate rock.....long tons..	681, 571	3, 296, 227
24	Salt.....barrels..	11, 698, 890	5, 654, 915
25	Limestone for iron flux.....long tons..	5, 172, 114	3, 620, 480
26	Zinc white.....short tons..	27, 500	2, 200, 000
27	Gypsum.....do.....	256, 259	695, 492
28	Borax.....pounds..	13, 500, 000	900, 000
29	Mineral paints.....short tons..	51, 704	767, 766
30	Grindstones.....do.....	.....	272, 244
31	Fibrous talc.....short tons..	41, 925	472, 485
32	Asphaltum.....do.....	87, 680	445, 375
33	Soapstone.....do.....	23, 908	437, 449
34	Precious stones.....do.....	.....	312, 050
35	Pyrites.....long tons..	109, 788	305, 191
36	Corundum.....short tons..	1, 771	181, 300
37	Oilstones, etc.....do.....	.....	146, 730
38	Mica.....pounds..	75, 000	100, 000
39	Barytes (crude).....short tons..	32, 108	130, 025
40	Bromine.....pounds..	379, 480	64, 502
41	Fluorspar.....short tons..	12, 250	89, 000
42	Feldspar.....long tons..	15, 000	75, 000
43	Manganese ore.....do.....	13, 613	129, 586
44	Flint.....do.....	20, 000	80, 000
45	Monazite.....pounds..	.....	.....
46	Graphite.....do.....	.....	104, 000
47	Bauxite.....long tons..	10, 518	34, 183
48	Sulphur.....short tons..	2, 688	80, 640
49	Fuller's earth.....do.....	.....	.....
50	Marls.....do.....	125, 000	65, 000
51	Infusorial earth.....do.....	.....	43, 655
52	Millstones.....do.....	.....	23, 417
53	Chromic iron ore.....long tons..	1, 500	25, 000
54	Cobalt oxide.....pounds..	7, 869	15, 738
55	Magnesite.....short tons..	1, 004	10, 040
56	Asbestos.....do.....	104	6, 416
57	Rutile.....pounds..	100	300
58	Ozocerite (refined).....do.....	60, 000	8, 000
59	Total value of nonmetallic mineral products.....	.....	339, 958, 842
60	Total value of metallic products.....	.....	307, 716, 239
61	Estimated value of mineral products unspecified.....	.....	1, 000, 000
62	Grand total.....	.....	648, 675, 081

SUMMARY.

25

for the calendar years 1880 to 1896—Continued.

1893.		1894.		1895.		
Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	
7, 124, 502	\$84, 810, 426	6, 657, 388	\$65, 007, 247	9, 446, 308	\$105, 198, 550	1
60, 000, 000	77, 575, 757	49, 501, 122	64, 000, 000	55, 727, 000	72, 051, 000	2
1, 739, 081	35, 950, 000	1, 910, 816	39, 500, 000	2, 254, 760	46, 610, 000	3
339, 785, 972	32, 054, 601	364, 866, 808	33, 141, 142	392, 639, 964	38, 682, 347	4
163, 982	11, 839, 590	159, 331	9, 942, 254	170, 000	11, 220, 000	5
78, 832	6, 306, 560	75, 328	5, 288, 026	89, 686	6, 278, 020	6
30, 164	1, 108, 527	30, 416	934, 000	36, 104	1, 837, 131	7
339, 629	266, 903	550, 000	316, 250	920, 000	464, 600	8
250	45, 000	200	36, 000	450	68, 000	9
49, 399	22, 197	9, 616	3, 269	10, 302	3, 091	10
8, 938	1, 788	.....	.....	.....	.....	11
75	517	100	600	150	900	12
.....	219, 981, 866	.....	218, 168, 788	.....	281, 913, 639	13
128, 385, 231	122, 751, 618	118, 820, 405	107, 653, 501	135, 118, 193	115, 749, 771	14
48, 185, 306	85, 687, 078	46, 358, 144	78, 488, 063	51, 785, 122	82, 019, 272	15
.....	33, 885, 573	.....	36, 534, 788	.....	33, 319, 131	16
48, 412, 666	28, 932, 326	49, 344, 516	35, 522, 095	52, 892, 276	57, 632, 296	17
.....	14, 346, 250	.....	13, 954, 400	.....	13, 006, 650	18
.....	9, 000, 000	.....	9, 000, 000	.....	9, 000, 000	19
400, 000	900, 000	360, 000	800, 000	360, 000	800, 000	20
8, 002, 467	6, 262, 841	8, 362, 245	5, 030, 081	8, 731, 401	5, 482, 254	21
23, 544, 495	4, 246, 734	21, 569, 608	3, 741, 846	21, 463, 543	4, 234, 237	22
941, 368	4, 136, 070	996, 949	3, 479, 547	1, 038, 551	3, 606, 094	23
11, 816, 772	4, 054, 668	12, 967, 417	4, 739, 285	13, 669, 649	4, 423, 084	24
3, 958, 055	2, 374, 833	3, 698, 550	1, 849, 275	5, 247, 949	2, 623, 974	25
24, 059	1, 804, 420	19, 987	1, 399, 090	20, 710	1, 449, 700	26
253, 615	696, 615	239, 312	761, 719	265, 503	807, 447	27
8, 699, 000	652, 425	14, 680, 130	974, 445	11, 918, 000	595, 900	28
37, 724	530, 384	41, 926	494, 093	50, 696	621, 552	29
.....	338, 787	.....	223, 214	.....	205, 768	30
35, 861	403, 436	39, 906	435, 060	39, 240	370, 895	31
47, 779	372, 232	60, 570	353, 400	68, 163	348, 281	32
21, 071	255, 067	23, 144	401, 325	21, 495	266, 495	33
.....	264, 041	.....	132, 250	.....	113, 621	34
75, 777	256, 552	105, 940	363, 134	99, 549	322, 845	35
1, 713	142, 325	1, 495	95, 936	2, 102	106, 256	36
.....	135, 173	.....	136, 873	.....	155, 881	37
66, 971	88, 929	.....	52, 388	.....	55, 831	38
28, 970	88, 506	23, 335	86, 983	21, 529	68, 321	39
348, 399	104, 520	379, 444	102, 450	517, 421	134, 343	40
12, 400	84, 000	7, 500	47, 500	4, 000	24, 000	41
18, 391	96, 553	17, 200	98, 900	23, 200	133, 400	42
7, 718	66, 614	6, 308	53, 635	9, 547	71, 769	43
29, 671	103, 848	38, 000	145, 920	36, 800	117, 760	44
130, 000	7, 600	546, 855	36, 193	1, 573, 000	137, 150	45
843, 103	63, 232	918, 000	64, 010	.....	52, 582	46
9, 179	29, 507	11, 066	35, 818	17, 069	44, 000	47
1, 200	42, 000	500	20, 000	1, 800	42, 000	48
.....	.....	.....	.....	6, 900	41, 400	49
75, 000	40, 000	75, 000	40, 000	60, 000	30, 000	50
.....	22, 582	.....	11, 718	4, 954	20, 514	51
.....	16, 645	.....	13, 887	.....	22, 542	52
1, 450	21, 750	3, 680	53, 231	1, 740	16, 795	53
8, 422	10, 346	6, 763	10, 145	14, 458	20, 675	54
704	7, 040	1, 440	10, 240	2, 200	17, 000	55
50	2, 500	325	4, 463	796	13, 525	56
.....	.....	150	450	100	350	57
.....	.....	.....	.....	None.	None.	58
.....	328, 318, 020	.....	307, 455, 351	.....	338, 345, 361	59
.....	249, 981, 866	.....	218, 168, 788	.....	281, 913, 639	60
.....	1, 000, 000	.....	1, 000, 000	.....	1, 000, 000	61
.....	574, 299, 886	.....	526, 624, 139	.....	621, 259, 000	62

Mineral products of the United States for the calendar years 1880 to 1896—Continued.

		1896.	
Product.		Quantity.	Value.
METALLIC.			
1	Pig iron, value at Philadelphia.....long tons..	8,623,127	\$90,250,000
2	Silver, coining value.....troy ounces..	58,834,800	76,069,236
3	Gold, coining value.....do.....	2,568,132	53,088,000
4	Copper, value at New York City.....pounds..	460,061,430	49,456,603
5	Lead, value at New York City.....short tons..	188,000	10,528,000
6	Zinc, value at New York City.....do.....	81,499	6,519,920
7	Quicksilver, value at San Francisco.....flasks..	30,765	1,075,449
8	Aluminum, value at Pittsburg.....pounds..	1,300,000	520,000
9	Antimony, value at New York City....short tons..	601	84,290
10	Nickel, value at Philadelphia.....pounds..	17,170	4,464
11	Platinum (crude), value at San Francisco, troy ounces.....	163	944
12	Total value of metallic products.....		287,596,906
NONMETALLIC (spot values).			
13	Bituminous coal.....short tons..	137,640,276	114,891,515
14	Pennsylvania anthracite.....long tons..	48,523,287	81,748,651
15	Stone.....		30,142,661
16	Petroleum.....barrels..	60,960,361	58,518,709
17	Natural gas.....		13,002,512
18	Brick clay.....		9,000,000
19	Clay (all other than brick).....long tons..	360,000	800,000
20	Cement.....barrels..	9,513,473	6,473,213
21	Mineral waters.....gallons sold..	25,795,312	4,136,192
22	Phosphate rock.....long tons..	930,779	2,803,372
23	Salt.....barrels..	13,850,726	4,040,839
24	Limestone for iron flux.....long tons..	4,120,102	2,060,000
25	Zinc white.....short tons..	20,000	1,400,000
26	Gypsum.....do.....	224,139	573,344
27	Borax.....pounds..	13,508,000	675,400
28	Mineral paints.....short tons..	48,032	530,455
29	Grindstones.....		326,826
30	Fibrous talc.....short tons..	46,089	399,443
31	Asphaltum.....do.....	80,503	577,563
32	Soapstone.....do.....	22,183	354,065
33	Precious stones.....		97,850
34	Pyrites.....long tons..	115,483	320,163
35	Corundum and emery.....short tons..	2,120	113,246
36	Oilstones, etc.....		127,098
37	Mica (sheet).....		65,441
38	Mica (scrap).....		1,750
39	Barytes (crude).....short tons..	17,068	46,513
40	Bromine.....pounds..	546,580	144,501
41	Fluorspar.....short tons..	6,500	52,000
42	Feldspar.....long tons..	9,114	35,200
43	Manganese ore.....do.....	10,088	90,927
44	Flint.....do.....	11,124	24,226
45	Monazite.....pounds..	30,000	1,500
46	Graphite (crystalline).....do.....	535,858	48,460
47	Graphite (amorphous).....short tons..	760	
48	Bauxite.....long tons..	18,364	47,338
49	Sulphur.....short tons..	5,260	87,200
50	Fuller's earth.....do.....	9,872	59,360
51	Marls.....do.....	60,000	30,000
52	Infusorial earth.....do.....	3,846	26,792
53	Millstones.....		22,567
54	Chromic iron ore.....long tons..	786	6,667
55	Cobalt oxide.....pounds..	10,700	15,301
56	Magnesite.....short tons..	1,500	11,000
57	Asbestos.....do.....	504	6,100
58	Rutile.....pounds..	100	350
59	Total value of nonmetallic mineral products.....		333,936,310
60	Total value of metallic products.....		287,596,906
61	Estimated value of mineral products unspecified.....		1,000,000
62	Grand total.....		622,533,216

IRON ORES.

By JOHN BIRKINBINE.

PRODUCTION.

The year ending December 31, 1898, recorded the maximum iron-ore production for the United States, a total of 19,433,716 long tons. This was 1,915,670 long tons, or 11 per cent, in excess of the previous maximum of 17,518,046 long tons produced in 1897.

This is also a greater amount than has been mined by any other country in one year, being over one and a third million tons above the total recorded for Great Britain in 1880, when 18,026,049 long tons were mined. It should also be borne in mind that the ores of the British Isles averaged lower percentages of metal than those exploited in this country and therefore represent a smaller pig-metal product.

Twenty-four States and Territories contributed to the iron-ore output in 1898, all of the producing States reporting advances with the exceptions of Georgia and North Carolina, Virginia, Ohio, New York, Maryland, Connecticut, Massachusetts, Texas, and Wisconsin.

This increased output was, however, principally from the State of Michigan, which in round numbers added two-thirds of the one and three-quarter millions excess credited to 1898.

The output of iron ore in the United States in 1898, compared with previous years, is illustrated by the annexed table, 1889 being the year when the statistics were first systematically collected by the United States Geological Survey:

Production of iron ore in the United States from 1889 to 1898.

Year.	Production.	Year.	Production.
	<i>Long tons.</i>		<i>Long tons.</i>
1889.....	14,518,041	1894.....	11,879,679
1890.....	16,036,043	1895.....	15,957,614
1891.....	14,591,178	1896.....	16,005,449
1892.....	16,296,666	1897.....	17,518,046
1893.....	11,587,629	1898.....	19,433,716

The total in ten years aggregates 153,824,061 long tons; an apparent average of 15,382,406 long tons per annum.

This record represents the quantities of ore mined in each year and not the amounts shipped. A number of large producers carry little or no stock; others accumulate stock during winter and draw upon these reserves during the shipping season. In the former class are, as a rule, open-cut mines, while many of the mines wrought underground accumulate stock from development work or from actual exploitation when shipping is not practicable.

Few of the mines in the Southern States carry stocks of ore, and mineral is also mined from the Cornwall Hills in Pennsylvania as it is demanded by local furnaces. At many of the Lake Superior mines enormous stock piles accumulate during the suspension of lake navigation, but while the shipping season lasts ore is sent to lower lake ports more rapidly than it is consumed, the receiving docks on Lake Erie having had on storage a total of 5,900,000 tons of ore.

The major portion of the domestic iron ore is smelted to produce pig iron, and a table is presented to show the annual output of pig iron for the same intervals that the iron ore output is recorded.

Production of pig iron in the United States from 1889 to 1898.

Year.	Production.	Year.	Production.
	<i>Long tons.</i>		<i>Long tons.</i>
1889.....	7,603,642	1895.....	9,446,308
1890.....	9,202,703	1896.....	8,623,127
1891.....	8,279,870	1897.....	9,652,680
1892.....	9,157,000	1898.....	11,773,934
1893.....	7,124,502		
1894.....	6,657,388	Total	87,521,154

The amount of domestic pig iron produced in the last decade was therefore 87,521,154 long tons, and to produce this the iron-ore mines of the United States contributed 153,824,061 long tons of ore. This would indicate that 1.76 tons of ore were required to make 1 ton of pig metal, which, although approximately correct, is subject to allowances for stocks on hand, foreign ores imported, ore used for other purposes, and iron-bearing material other than ore fed to blast furnaces.

Of the different varieties of iron ores mined in 1898, the red hematites contributed 16,150,684 long tons, or 83.1 per cent of the total, an increase of 1,737,366 long tons, or 12 per cent, over the 1897 output of 14,413,318 long tons. The brown hematite amounted to 1,989,681 long tons, or 10.2 per cent of the total, an advance of 27,727 tons, or 1.4 per cent. The product included 1,237,978 long tons, or 6.4 per cent, of magnetite, an increase of 178,499 long tons, or 16.8 per cent, over the 1897 output of 1,059,479 long tons; the balance, 55,373 long tons, or 0.3

per cent, was carbonate, a decrease of 27,922 long tons, or 33.5 per cent, from the 1897 total of 83,295 long tons.

Michigan heads the list of red hematite producers, followed by Minnesota, while Virginia is first as a miner of brown hematite, Alabama and Tennessee being second and third, respectively. Nearly one-half the total magnetite was mined in Pennsylvania, New Jersey ranking second and New York third. Ohio was the principal carbonate ore producer, followed by Maryland.

The following table indicates the amounts of the various classes of ore produced by the different States in 1898. Where publication of the total for any State is likely to divulge data in regard to individual mines this has been combined with neighboring States as in previous reports. The classification is not mineralogically exact, for local conditions affect the nomenclature of some ores, and in some deposits where several varieties of ore are mined no attempt is made by the miners to separate the product into classes:

Production of iron ores in 1898.

States.	Red hematite.	Brown hematite.	Magnetite.	Carbonate.	Total.
	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>
Michigan	7, 192, 376		154, 470		7, 346, 846
Minnesota	5, 963, 509				5, 963, 509
Alabama	1, 853, 111	548, 637			2, 401, 748
Pennsylvania	13, 975	142, 725	614, 818	1, 564	773, 082
Tennessee	284, 616	306, 611			593, 227
Virginia	2, 963	554, 750			557, 713
Wisconsin	509, 645				509, 645
Colorado	10, 070	302, 368	6, 042		318, 480
New Jersey			275, 438		275, 438
Missouri	203, 148	2, 199			^a 205, 347
New York	6, 400	14, 000	155, 551	4, 000	179, 951
Georgia and North Carolina	79, 125	78, 869	2, 089		160, 083
Montana, Nevada, New Mexico, Utah, Wyoming ..	18, 833	7, 566	29, 570		55, 969
Ohio				43, 868	43, 868
Connecticut and Massachusetts		20, 251			20, 251
Kentucky	12, 913				12, 913
Texas		9, 705			9, 705
Maryland				5, 941	5, 941
Total	16, 150, 684	1, 969, 681	1, 237, 978	55, 373	19, 433, 716

^a Including lean ore not formerly reported. See data concerning Missouri production, p. 41.

The continued increased production of red hematite will be noted, for, owing to its prevailing high percentages of iron and ease of smelting, it is preferred by many blast-furnace managers. The enormous development of the red hematites, which predominate in the Lake Superior region, and the liberal exploitation of this class of mineral in Alabama have done much to encourage this favoritism.

The brown hematite ores have in ten years declined in importance less than the other varieties, the output in 1898 being but a half million tons less than in 1889, while in a similar space of time the magnetite mined has decreased about one-half, or one and a quarter million tons, and the carbonate ore to one-eighth of the 1889 product of 432,251 long tons.

The following table will show the amounts of the different classes of iron ores mined from 1889 to 1898, inclusive:

Production of iron ore in the United States, by classes.

[Maxima in italic figures.]

Year.	Red hematite.	Brown hematite.	Magnetite.	Carbonate.	Total.
	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>
1889.....	9,056,288	2,523,087	2,506,415	<i>432,251</i>	14,518,041
1890.....	10,527,650	2,559,938	<i>2,570,838</i>	377,617	16,036,043
1891.....	9,327,398	<i>2,757,564</i>	2,317,108	189,108	14,591,178
1892.....	11,646,619	2,485,101	1,971,965	192,981	16,296,666
1893.....	8,272,637	1,849,272	1,330,886	134,834	11,587,629
1894.....	9,347,434	1,472,748	972,219	87,278	11,879,679
1895.....	12,513,995	2,102,358	1,268,222	73,039	15,957,614
1896.....	12,576,288	2,126,212	1,211,526	91,423	16,005,449
1897.....	14,413,318	1,961,954	1,059,479	83,295	17,518,046
1898.....	<i>16,150,634</i>	1,989,681	1,237,978	55,373	<i>19,433,716</i>
Total..	113,832,311	21,827,915	16,446,636	1,717,199	153,824,061
Percentages of total for ten years	74	14.2	10.7	1.1	.....
Percentages of total for 1898 ..	83.1	10.2	6.4	0.3	.....

The relative proportions of the various classes as represented by the production of a decade and by the output in 1898 will illustrate the change in their use.

In addition to the iron ore mined, 48,502 long tons of zinc residuum

were produced in the year 1898, which was utilized in the manufacture of spiegeleisen.

Cinder from rolling mills and steel furnaces is also liberally used with natural iron ores.

The reported production of concentrated iron ore in the year 1898 was 38,434 long tons. It is probable that the augmenting value of iron ores will encourage the operation of concentration plants.

The period of depression from which the iron ore industry has just emerged made necessary many economies which will continue to reduce the mining costs, while the demands of the blast furnace managers have become more exacting. A few years ago a "Bessemer" ore was accepted which carried 0.01 per cent of phosphorus to 1 unit of iron, but now an ore is not regarded as "Bessemer" which contains over 0.0075 of phosphorus to every unit of iron. The hard ore was formerly shipped as mined, but is now crushed at the mine before it is sent to the lake ports. The product of ore per man has increased, the methods of mining are more economical, and there are also savings in timbering, in mining, and in transporting ore to the surface. A large Lake Superior mine, wrought underground, now mines ores at the rate of 4 or 5 tons per day per man employed. On the older ranges the figures run from 2 to 4 tons per day per man. At milling properties as much as 80 tons per day per man has been recorded and a fair average might be half of this.

The provision for stripping and of underground facilities necessarily precedes mining by the milling process.

The lake transportation costs have been wonderfully reduced. In 1890 the freight rate from the head of the lakes was from \$1.10 to \$1.35 per ton; in 1898 it was but 60 cents per ton. It is claimed that owing to increased draft, larger vessels, more economical engines, prompt loading and discharging, etc., the transportation companies earn as much on long hauls at the latter rate as they earned in former times on double the amount now received.

The railroad companies have also reduced the cost of transportation by means of larger cars, more powerful engines, excellent docks, etc., so that ore is now mined, taken to the lakes, put on board vessels, transported to lower lake ports, and forwarded by rail to the furnaces where it is delivered and sold at prices below what was paid for cost of lake transportation alone from Marquette twenty-five years ago.

THE LAKE SUPERIOR REGION.

The Lake Superior region has materially increased its former maximum output of 12,205,522 long tons in 1897, the production in 1898 being 13,779,308 long tons.

The amount mined from the various ranges during the last ten years has been as follows:

Production of Lake Superior iron ores by ranges.

[Maxima in italics.]

Range.	1889.	1890.	1891.	1892.	1893.
	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>
Marquette ...	2, 631, 026	2, 863, 848	2, 778, 482	2, 848, 552	2, 064, 827
Menominee...	1, 876, 157	2, 274, 192	1, 856, 124	<i>2, 402, 195</i>	1, 563, 049
Gogebic.....	2, 147, 923	2, 914, 081	2, 041, 754	<i>3, 058, 176</i>	1, 466, 815
Vermilion....	864, 508	891, 910	945, 105	1, 226, 220	815, 735
Mesabi.....	-----	-----	-----	29, 245	684, 194
Total ..	7, 519, 614	8, 944, 031	7, 621, 465	9, 564, 388	6, 594, 620

Range.	1894.	1895.	1896.	1897.	1898.
	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>
Marquette ...	1, 935, 379	1, 982, 080	2, 418, 846	2, 673, 785	<i>2, 987, 930</i>
Menominee...	1, 255, 255	1, 794, 970	1, 763, 235	1, 767, 220	2, 275, 664
Gogebic.....	1, 523, 451	2, 625, 475	2, 100, 398	2, 163, 088	2, 552, 205
Vermilion....	1, 055, 229	1, 027, 103	1, 200, 907	<i>1, 381, 278</i>	1, 125, 538
Mesabi.....	1, 913, 234	2, 839, 350	3, 082, 973	4, 220, 151	<i>4, 837, 971</i>
Total ..	7, 682, 548	10, 268, 978	10, 566, 359	12, 205, 522	<i>18, 779, 308</i>

In this table the ranges have been placed according to the date of their opening, the Mesabi range, the youngest, with its easily won ores, being the largest producer. The ores from this district, while generally of desirable chemical composition and rich in iron, are handicapped to some extent by the fineness of the ores, many furnace men using them but moderately as mixtures with the harder ores from the other ranges.

The next largest producer, the Marquette range, contributed 2,987,930 long tons in 1898. Instead of declining in output, as has been frequently predicted because of competition with other ranges, the Marquette range has shown a constant increase since the year 1894.

The Ludington mine, on the Menominee range, which was filled with water for a number of years, is now being actively operated by the Chapin Mining Company, and several other mines which were idle have resumed operations, aiding in swelling the total for the district.

The Menominee, Gogebic, and Vermilion ranges did not produce their maxima in 1898, but yielded outputs in advance of the average for a series of years.

A feature of the year 1898 was the concentration of a number of the larger producing mines, most of which were purchased or leased by important consuming interests.

A unique deposit of iron ore is being actively exploited at the Cundy mine, on the Marquette range. Mr. Charles H. Foote, the president, describes this ore as "a hard ore which seems to be growing better as

depth is obtained in the mine. While not strictly a magnetite, it can not be classed as blue hematite. There seems to be a large deposit of it."

The increased demand for iron ore which caused practically the entire output of the Lake Superior region to be purchased shortly after prices were fixed by the Bessemer Ore Association may encourage exploitation of old or inactive mines and add temporarily to the prosperity of the region. The portion of the 1899 output not immediately sold will command higher prices than the ores under contract, for Mesabi range contracts have closed for non-Bessemer ores at prices practically equal to those obtained earlier for the standard Bessemer ores of that range. The advance in the price of pig iron has been thus far of more advantage to the blast furnaces than to the iron mines, as the greater portion of the iron ores of the Lake Superior region for 1899 were sold at an advance of but about 15 cents above that for 1898.

To add to the value of the statistical data the following table of cargo analyses of Lake Superior ores for the year 1898, prepared by the Bessemer Ore Association, is given, and a comparison with similar analyses published in the reports for 1896 and 1897 will be of interest.

Cargo analyses of Lake Superior iron ores, in the season of 1898.
GOGEBIC RANGE.

Designation of ore.	Iron, nat- ural state.	Dried at 212° Fahrenheit.										Moi- sture.
		Iron.	Silica.	Phos- pho- rus.	Man- ga- nese.	Alumi- na.	Lime.	Mag- nesia.	Sul- phur.	Organ- ic and vol atile mat- ter.		
	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	
Atlantic.....	55.63	62.89	4.29	0.047	0.86	1.49	0.18	0.15	0.021	3.25	11.54	
Ashland.....	55.44	63.19	3.96	.036	.25	2.21	.21	.15	.015	3.00	12.27	
Aurora.....	55.35	61.34	6.72	.028	.40	1.02	.27	.11	.018	4.12	9.77	
Best.....	50.34	58.00	10.25	.0616	.81	1.83	.31	.16	.013	3.28	13.20	
Brotherton *	55.60	63.00	7.20	.085	.47	.87	.21	.04	.018	1.00	11.74	
Buckeye.....	53.08	59.44	8.40	.071	.423	1.526	.24	.266	.013	4.76	10.70	
Cary Empire.....	52.99	58.21	3.22	.059	4.50	.80	.27	.14	None.	5.60	8.96	
Colby No. 1.....	51.58	56.70	3.20	.066	6.82	.88	.16	.40	.006	2.20	9.02	
Colby No. 2.....	54.66	60.60	4.00	.080	2.25	1.10	.17	.47	.008	2.15	9.80	
Day.....	56.80	63.58	3.11	.078	.3319						10.67	
Fairfax.....	55.24	64.05	3.00	.0728	.9915						13.76	
Globe.....	55.20	62.02	3.93	.095	.21	1.70	.35	.15	.010	3.25	11.00	
Iron Belt.....	53.74	60.75	8.09	.041	.40	1.21	.11	.18	.024	3.09	11.54	
Lawrence.....	56.04	62.28	5.64	.059	.552	1.126	.11	1.35	.006	3.86	10.02	
Melroe*.....	55.39	62.00	4.92	.030	1.11	.81	.07	.10	.018	3.90	10.66	
Montreal.....	60.56	66.00	2.31	.040	.36	.71	.23	.09	.007	1.90	8.24	
Newport No. 1.....	48.71	54.05	4.60	.037	8.01	1.20	.15	.07	.006	5.50	9.87	
Newport No. 2 *.....	45.00	50.00		.035	6.00						10.00	
New Era *.....	50.80	57.00	12.15	.026	1.26	1.05	.47	.11	.005	3.59	10.87	
Norman (Palms) ..	53.94	62.00	4.61	.085	.84	1.29	.23	.17	.014	3.67	13.00	
Norrie.....	56.56	63.08		.0388	.3888						10.34	
North Vein.....	56.29	62.37	4.10	.046	.54	.89	.62	.09	.004	3.24	9.75	
Palms.....	53.92	62.95	3.94	.055	.90	1.17	.16	.14	.017	3.53	14.34	
Rand.....	52.74	58.57	5.25	.036	3.21	1.07	.66	.60	.017		9.95	
Shores.....	58.87	64.28	3.30	.029	.30	.75	.18	.11	.004	1.12	8.42	
Tilden.....	54.83	63.43		.046	1.0902						13.56	
Toronto.....	44.83	49.00	26.00	.045	.45	1.25	.40	.25	.015		8.50	

Above are average cargo analyses of the season 1898, except when marked thus: (*). Ores so marked show the expected analyses for the season 1899.

Cargo analyses of Lake Superior iron ores, in the season of 1898—Continued.

MARQUETTE RANGE.

Designation of ore.	Iron, natural state.	Dried at 212° Fahrenheit.									Moisture.
		Iron.	Silica.	Phosphorus.	Manganese.	Alumina.	Lime.	Magnesia.	Sulphur.	Organic and volatile matter.	
	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.
Angeline, Hard ...	63.66	66.89	2.25	0.013	0.09	1.27	0.11	0.04	0.014	0.50	4.83
Angeline, H'm ...	59.14	65.37	2.69	.041	.30	1.05	.12	.08	.018	2.01	9.53
Angeline, South ...	54.60	62.17	4.75	.135	.27	1.63	.25	.15	.020	3.68	12.17
Bell ...	40.25	41.18	37.22	.030	.18	1.04	.09	.12	.031	1.62	2.26
Cambria ...	55.34	61.80	6.70	.051	.28	1.90	.97	.34	.008	2.12	10.45
Cambridge ...	51.91	62.04	5.78	.192	1.00	.142	1.66	.88	.002	1.37	16.32
Champion No. 1 *	64.35	65.00	4.59	.055	.09	2.27	.96	.66	.007	.....	1.00
Cleveland Bess ...	66.80	67.09	2.25	.028	.10	1.20	.23	.28	.024	.28	.43
Cliffs Shaft ...	61.82	62.50	3.40	.107	.37	1.86	1.34	1.12	.027	2.20	1.08
Dartmouth * ...	65.00	65.75	2.52	.032	.18	1.74	.32	.11	.014	.32	1.14
Essex * ...	59.40	60.00	10.25	.110	.30	2.20	.53	.20	.020	.....	1.00
Foster ...	49.58	51.45	18.45	.142	.27	1.10	.18	.39	.020	5.18	3.63
Harvard Bess. *	56.89	65.00	3.15	.050	.31	1.78	.32	.18	.020	2.09	12.48
Ishpeming ...	51.08	59.52	6.75	.067	.48	2.18	.22	.40	.010	4.17	14.18
Jackson, Pit 7 ...	52.70	55.21	13.71	.067	.....	3.25	.....	.....	.....	.....	4.55
Jackson, Hard No. 2 Bess. *	48.56	50.01	24.23	.047	.15	2.93	.....	.....	.02	.....	2.90
Kenyon * ...	46.10	52.00	18.00	.110	.71	1.22	.30	.19	.027	3.83	11.34
Lake ...	51.69	60.00	5.79	.088	.71	2.70	.35	.67	.019	4.43	13.85
Lake Bessemer * ...	56.12	64.21	3.98	.038	.52	1.51	.23	.15	.023	1.80	12.59
Lake Bess., E. End *	53.74	61.00	7.40	.043	.42	2.17	.28	.16	.023	2.71	11.90
Lake Silica ...	42.86	48.16	25.17	.039	.43	1.69	.36	.47	.035	1.65	11.00
L. Superior, No. 1 *	64.23	65.00	3.64	.094	.81	2.14	.37	.36	.013	.49	1.16
Lillie ...	55.43	62.56	5.40	.074	.39	1.97	.34	.11	.008	3.12	11.40
Manganif. H'm. *	48.67	54.29	7.20	.071	4.61	2.20	.82	2.57	.025	.....	10.35
Marquette ...	39.28	41.06	36.85	.055	.30	1.07	.20	.16	.020	1.67	4.37
Negaunee ...	55.76	62.65	4.31	.056	.....	2.83	.....	.....	.....	.....	11.00
Negaunee, n. Bess.	53.40	60.00	4.31	.115	.....	2.83	.....	.....	.....	.....	11.00
Norfolk * ...	55.52	56.00	13.43	.055	.11	3.18	.71	1.05	.03	.....	.85
Old Mine H'm. Bess.	54.98	63.16	4.17	.067	.49	2.00	.30	.28	.020	2.78	12.95
O.M.H'm.n. Bess. *	53.36	61.00	5.50	.101	.75	2.00	.48	.59	.027	2.99	12.52
Princeton * ...	54.09	64.92	3.16	.055	.73	1.59	1.12	.742	.001	1.20	16.68
Queen ...	53.51	61.40	5.56	.150	.294	2.623	.45	.468	.010	2.90	12.85
Republic, Special.	66.78	67.07	2.80	.018	Trace.	.71	.10	.08	.016	.....	.43
Republic, Specular	66.21	66.74	2.70	.034	.18	1.00	.17	.11	.011	.29	.79
Republic, Kingston *	63.46	64.00	6.13	.034	.23	.82	.31	.209	.032	.045	.84
Rose ...	54.40	61.40	6.40	.120	.37	1.80	.42	.11	.008	3.22	11.40
Richmond ...	43.05	43.60	36.20	.034	.04	.64	.49	.11	.004	2.74	1.27
Salisbury ...	53.48	62.50	4.44	.117	.31	1.77	.38	.13	.013	4.13	14.43
Salisbury Bess ...	54.12	63.60	3.43	.044	.25	1.38	.13	.18	.017	4.45	14.91
Salisbury Silica ...	42.99	49.60	23.28	.050	.33	1.75	.18	.20	.021	3.11	13.33
Savoy * ...	60.08	61.00	9.11	.097	.32	1.97	.45	.39	.020	1.07	1.50
Sec. 16, No. 1 Bess.	62.23	65.26	4.70	.022	.18	1.59	.29	.22	.015	.50	4.64
Sec. 16, No. 2 Bess.	60.45	62.06	8.32	.032	.18	1.71	.34	.24	.015	.58	2.59
Sec. 21, Hematite *	54.53	61.50	6.15	.147	.46	1.29	.48	.20	.027	3.25	11.34
Sheffield ...	60.05	61.48	9.12	.024	.24	1.82	.13	.08	.024	.55	2.33
Tilden Silica ...	41.07	41.90	38.30	.033	.10	.82	.19	.13	.018	.65	1.97

Above are average cargo analyses of the season 1898, except when marked thus: (*). Ores so marked show the expected analyses for the season 1899.

IRON ORES.

35

Cargo analyses of Lake Superior iron ores, in the season of 1898—Continued.

MENOMINEE RANGE.

Designation of ore.	Iron, natural state.	Dried at 212° Fahrenheit.										Moisture.
		Iron.		Silica.	Phosphorus.	Manganese.	Alumina.	Lime.	Magnesia.	Sulphur.	Organic and volatile matter.	
		Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	
Aragon	59.10	63.24	4.39	.036	.14	1.01	.89	1.84	.007	1.28	6.54	
Amasa	53.34	56.00	6.98	.267	.35	3.35	1.90	1.74	.014	4.90	4.75	
Badger	54.21	59.73	4.18	.146	.443	2.72	1.10	3.22	.075	2.70	9.24	
Bristol *	52.08	56.00	3.75	.80	1.25	1.10	3.60	1.50	.030	.....	7.00
Chapin *	57.39	61.60	4.96	.065	.32	1.15	.61	2.20	.012	2.27	6.84	
Clifford	39.42	40.44	39.19	.016	.11	.85	.51	.26	.002	.70	2.51	
Columbia	58.40	60.00	3.78	.550	.23	1.99	.41	.80	.100	.....	11.00
Crystal Falls	53.62	58.60	4.45	.795	.20	1.41	2.40	.93	.008	2.14	8.50	
Davidson	51.37	56.39	6.25	.166	.395	3.12	1.50	3.49	.114	3.90	8.90	
Dunn	52.66	58.00	4.00	.582	.74	1.98	1.72	.81	.031	6.22	9.20	
Elmwood	53.14	58.16	5.69	.165	.331	2.804	1.18	2.317	.055	4.62	8.63	
Florence	51.62	56.10	4.79	.388	.31	2.18	1.17	1.92	.271	5.67	7.98	
Granada	57.80	62.42	4.56	.062	.18	1.03	.54	1.60	.017	1.70	7.40	
Great Western	56.15	61.30	4.60	.875	.24	1.16	2.10	.80	.006	3.10	8.40	
Hemlock	56.68	59.43	5.60	.302	.14	2.22	2.10	1.75	Trace.	2.33	4.62	
Keel Ridge *	39.46	40.64	37.42	.046	.20	.90	1.35	1.00	.006	1.50	2.90	
Lamont *	52.70	57.60	4.15	.73	.24	1.24	2.61	1.10	.006	2.10	8.50	
Lerida	58.80	63.48	3.74	.152	.137	1.15	.94	1.67	.003	1.05	7.37	
Lincoln *	56.85	62.20	4.70	.425	.320	1.67	1.42	.72	.010	2.84	8.60	
Loretto	53.13	58.50	9.80	.019	.24	1.92	.32	.29	.139	2.66	9.17	
Mastodon	58.23	61.78	2.20	.55	.15	2.40	.70	.20	.085	5.10	5.75	
Millie	59.75	63.21	2.54	.027	.20	.98	1.14	1.74	.009	2.51	5.48	
Nimick *	58.05	62.68	4.37	.078	.17	1.05	.64	1.62	.013	1.68	7.39	
Pewabic *	58.90	63.59	4.32	.012	.13	1.05	.91	1.22	.002	1.46	7.38	
Pewabic Genoa	42.14	44.00	32.89	.007	.09	1.10	.79	1.07	.005	1.18	4.22	
Rex	53.51	57.54	6.26	.066	1.08	1.52	1.24	3.98	.018	3.36	7.00	
Russel	52.40	56.35	6.72	.065	.30	2.21	2.37	3.48	.053	3.78	7.00	
San Jose	60.62	65.51	3.46	.0135	.25	1.14	.19	.26	.036	.73	7.47	
Star	58.02	62.29	4.80	.085	.31	1.35	.62	1.51	.007	1.95	6.86	
Toledo	50.61	54.00	18.23	.010	.18	.65	1.20	1.57	.003	.....	6.28

MESABI RANGE.

Adams	57.91	64.03	2.92	.032	.48	1.06	.17	.18	.023	3.25	9.56
Admiral	59.21	63.80	5.10	.027	.32	.59	.22	.142	.004	2.11	7.20
Ainalie	58.23	63.46	3.29	.063	.41	2.38	.21	.12	.008	2.85	8.24
Auburn	58.45	64.65	3.05	.045	.35	1.78	.53	.18	Trace.	2.18	10.00
Audrey	55.68	63.10	3.45	.059	.59	1.81	.30	.27	Trace.	3.32	11.75
Beaver	56.29	63.39	2.20	.083	.22	1.93	.24	.17	.020	3.50	11.20
Biwabik	58.52	63.47	3.75	.039	.50	1.00	.27	.12	.004	3.35	7.80
Canton*	54.72	60.80	4.25	.048	.49	.93	.71	.07	Trace.	7.31	10.00
Commodore*	58.14	61.10	3.90	.039	.20	1.21	.24	.06	.004	3.40	9.30
Duluth	54.11	60.94	5.10	.043	.36	1.48	.20	.16	.011	5.46	11.20
Fayal	56.92	63.09	3.38	.031	.91	1.09	.30	.24	Trace.	3.68	9.78
Genoa	57.18	63.49	4.05	.030	.48	.84	.40	.25	Trace.	3.30	9.94
Hartley	58.21	64.94	2.50	.037	.44	1.55	.45	.17	.004	2.77	10.36
Hibbing	58.25	65.24	2.78	.028	.441	1.068	.08	.108	.011	2.34	10.71

Above are average cargo analyses of the season 1898, except when marked thus: (*). Ores so marked show the expected analyses for the season 1899.

Cargo analyses of Lake Superior iron ores, in the season of 1898—Continued.

MESABI RANGE—Continued.

Designation of ore.	Iron, natural state.	Dried at 212° Fahrenheit.									Moisture.
		Iron.	Silica.	Phosphorus.	Manganese.	Alumina.	Lime.	Magnesia.	Sulphur.	Organic and volatile matter.	
	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>
Juniata	51.50	58.88	5.89	.068	.94	.....	.....	.....	.....	.....	12.54
Linwood	57.19	63.44	8.90	.049	.64	1.45	.30	.19	.006	2.60	9.85
Mountain	56.07	63.95	4.01	.049	.35	.....	.....	.....	.....	.....	12.82
Oliver	54.46	61.95	4.78	.060	.54	.....	.....	.....	.....	.....	12.09
Pillsbury	56.87	62.72	3.41	.023	.72	1.09	.09	.13	.001	3.86	9.33
Preble	52.87	58.91	5.34	.079	1.26	.....	.....	.....	.....	.....	10.25
Penobscot	55.90	63.50	4.07	.032	.47	1.21	.19	.10	.011	.....	11.96
Sellers	58.23	64.39	3.49	.036	.39	1.35	.12	.05	.020	2.30	9.56
Sparta	60.77	65.30	2.70	.029	.31	.74	.45	.23	Trace.	2.35	6.94
Top Brown	58.14	63.45	3.29	.052	.52	.82	.50	.16	.004	3.04	8.36
Vulcan	60.08	64.60	3.06	.037	.50	.80	.35	.25	Trace.	2.90	7.00

VERMILION RANGE.

Chandler	60.98	64.72	4.02	.037	.11	1.94	.40	.11	Trace.	.90	5.78
Long Lake	57.11	61.64	6.97	.042	.17	3.38	.37	.17	Trace.	1.38	7.35
Minnesota	66.67	67.37	2.50	.055	.11	.69	.31	.11	.005	.26	1.04
Pilot	55.06	60.10	8.95	.044	.25	2.95	.21	.09	.024	1.34	8.38
Pioneer	59.80	64.48	4.33	.037	.202	2.123	.10	.072	None.	1.24	7.26
Red Lake	61.66	63.32	4.58	.123	.14	1.70	.47	.46	.007	.75	2.62
Vermilion	65.91	66.72	2.19	.137	.09	.90	.56	.25	.010	.43	1.21

Above are average cargo analyses of the season 1898, except when marked thus: (*). Ores so marked show the expected analyses for the season 1899.

A résumé of these analyses indicate that the ores as shipped from the various ranges contain the following percentages of metallic iron and proportions of moisture:

General composition of Lake Superior iron ores.

Range.	Iron (natural state).		Moisture.	
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Marquette	66.8	to 39.26	0.43	to 16.68
Menominee	60.62	to 39.46	2.51	to 11.00
Gogebic	60.56	to 44.83	8.24	to 14.34
Vermilion	66.67	to 55.06	1.04	to 8.38
Mesabi	60.77	to 51.50	6.94	to 12.54

It will be noted that comparatively few Lake Superior ores contain in their natural state 60 per cent or more of metallic iron, and that the richer ores are practically confined to the Marquette and Vermilion ranges, where some ores approach 67 per cent of iron. But the ores are marketed upon analyses made after drying at 212° Fahrenheit,

and comparatively few are shipped which show on this basis less than 60 per cent of metal. The leaner ores specified in the table have some special value, either because of very low phosphorus contents, the manganese they carry, or, because being highly siliceous and cheaply mined, they form desirable mixtures with low silica ores.

The variations in the amount of phosphorus are less in the Gogebic and Mesabi ranges, but the smallest and largest individual percentages of this element are in Menominee ores. As a rule, the value of an ore is based primarily upon the amounts of metallic iron and phosphorus.

THE INDUSTRY IN VARIOUS STATES.

MICHIGAN.

Michigan continues to hold first rank as an iron-ore producer, although it is probable that in 1899 it may be closely pushed by Minnesota. The 1898 output of 7,346,846 long tons, which was 37.8 per cent of the total for the United States, shows an increase of 1,259,383 long tons, or 20.69 per cent, over the 1897 total of 6,087,463 long tons. Of this amount 7,192,376 long tons, or 97.9 per cent, was red hematite, and 154,470 long tons, or 2.1 per cent, magnetite.

The total value of the iron ore produced in Michigan in the year 1898 was \$10,368,807, or \$1.41 per ton. The Marquette range and the largest producing mines of the Menominee and Gogebic ranges are in the State of Michigan.

As indicating the material reduction in royalties to be paid for ore won, and the recognized policy of having royalties based upon the selling price of iron ore, one of the companies owning large mineral areas has established the following sliding scale:

The value of the ore is to be based upon the average market price of similar ore on docks in Lake Erie ports for three months preceding. When this value does not exceed \$1.49, the royalty to be 7 cents per gross ton; if between \$1.50 and \$1.59 per long ton, the royalty to be 8 cents per ton; increasing 1 cent for each 10 cents per ton until the market price is \$1.89 per ton, after which the royalty increases 1 cent for each 5 cents advance in value; thus, when ore commands on Lake Erie docks \$1.49 per long ton, the royalty will be 7 cents; \$1.89, 11 cents; \$1.94, 12 cents; \$2, 14 cents; \$2.50, 24 cents; \$3, 34 cents.

The State occupied first position as a producer of red hematite and fourth place in mining magnetite ores.

MINNESOTA.

All of the iron ore contributed by Minnesota in the year 1898, viz, 5,963,509 long tons, was of the red hematite variety, giving the State second place in the list of producers and also in the red hematite class of iron ores. The amount won in 1898, 5,963,509 long tons, was 362,080 long tons, or 6.46 per cent, greater than the 1897 total of 5,601,429 long tons.

The Vermilion and Mesabi iron-ore ranges are entirely within the limits of the State of Minnesota.

An interesting lawsuit was brought in the latter part of the year 1897 before the Minnesota railroad commission. Some of the mine owners instituted suit against the Duluth and Iron Range and the Duluth, Mesabi and Northern railroads to secure lower freight rates than 80 cents per ton from the Mesabi range and \$1 per ton from the Vermilion range to Lake Superior ports. The independent operators claimed that these two roads, being interested in ore consumption, charge rates which they themselves can pay by merely taking money from one pocket and putting it in another, while the ore producers, who sell to furnacemen, had no such advantage. It was also claimed that if the above rates were reduced, there would be encouragement for mines now inactive to operate and ship, at a small profit, ore of grades slightly below the limit at which a profitable sale could then be made. There are several such mines in Minnesota, the operation of which it was claimed would increase the employment of labor in the State. It was also asserted that the railroads were making a profit not commensurate with their investment.

The railroad companies and the associated mining companies denied the latter statement, and asserted that the prices of ore from the Minnesota ranges were not based on the idea of doing business on a profit, but on what it cost the Carnegie Steel Company and other large companies to deliver ore of the same metallic content at the furnaces. Any reduction from the rail rate from the mines to Lake Superior would be given to them and to other furnace operators as well as to the smaller independent mines, and the latter would be in the same position as before, only getting a price for the ores which would be less by the reduced amount of freight than at present. It was also argued that 12,000 people in St. Louis County were dependent for their living upon the mining of iron ore and its transportation to the lake, and as many more receive support indirectly from the mines, while the independent mine owners were few, and that the reduction in rates would unfavorably affect these 25,000, and would benefit only the few living in distant parts of the country.

The testimony given by some of the large mine owners and interested parties was to the effect that a reduction of freight rates would not affect independent operators on the Mesabi range, as the blast-furnace managers, owing to the difference in the price of Mesabi and other ores, amounting in those of similar composition to 70 to 75 cents per ton, had used, and would use, as large an amount of this Mesabi ore as practicable. As to the amount of Mesabi ores which could be advantageously used, one witness stated that from 33 to 40 per cent was the practical maximum. Another had used from 5 to 100 per cent of Mesabi ores, but had a number of accidents, and considered 33 per cent the most judicious percentage. Another considered that 25 to 50

per cent of Mesabi ores could be used in a furnace mixture. Another testified that the Duquesne furnaces, near Pittsburg, built to use 75 per cent of Mesabi ores, were not able to utilize more than 35 per cent. Another stated that he used as much Mesabi ore as possible, as it was a great factor in reducing the cost of manufacture, and thought that five-sixteenths of Mesabi ores was as great a burden as was safe. This suit was discontinued.

Dr. N. P. Hulst, manager of the Oliver Iron Mining Company, has been conducting experiments in drying ores at the mines in order to effect a saving in freights. The amounts of moisture in some of the ores treated were: Mountain Iron, 12.25 per cent; Oliver and Lone Jack, 11.9 per cent; Pioneer, 7.5 per cent; Norrie, 10.3 per cent; Tilden, 13.9 per cent. By means of an experimental plant at the mines it was found that on an average about 10 per cent of water could be driven out. There was difficulty with some Mesabi ores, which were finely comminuted, but it is believed that this would not prove a serious obstacle, and that, including the cost of fuel in heating the ore, drying would be found to be advantageous, owing to the reduction in freight rates.

While the dried ore would probably occupy the same space in the vessel or car, or possibly more than in its natural state, it would weigh fully 12 per cent less, and would enable the boats to carry a greater tonnage, for ore is now put in the boats in a comparatively thin layer because of its great weight. It is claimed that the ore will not again absorb moisture after it is placed in the stock pile, so that, if once dried at the mines, the saving would be continued to the furnace. No definite plans for continuing the experiment on a commercial scale are reported.

ALABAMA.

The State of Alabama, in the year 1898, continued in third place as a producer, but the output of iron ore increased from 2,098,621 long tons in 1897 to 2,401,748 long tons in 1898, a gain of 303,127 long tons, or 14.4 per cent. Of the amount produced in the year 1898, 1,853,111 tons were of the red hematite variety and 548,637 tons were brown hematite.

One of the important features of iron-ore mining in the year 1898 was the exploitation of brown hematite beds in the vicinity of Birmingham, which are found overlying the red hematites. This ore, if obtained in quantity, will be a valuable aid as a mixture in the blast furnaces of the district.

For the years for which statistics have been collected the production of the State of Alabama has been as follows:

Product of iron ore in Alabama since 1889.

Year.	Quantity.	Year.	Quantity.
	<i>Long tons.</i>		<i>Long tons.</i>
1889.....	1, 570, 319	1895.....	2, 199, 390
1890.....	1, 897, 815	1896.....	2, 041, 793
1891.....	1, 986, 830	1897.....	2, 098, 621
1892.....	2, 312, 071	1898.....	2, 401, 748
1893.....	1, 742, 410		
1894.....	1, 493, 086	Total	19, 744, 083

PENNSYLVANIA.

Pennsylvania, in 1898, increased the 1897 output of 723,742 long tons by 49,340 long tons, or 6.82 per cent, reaching 773,082 long tons. The State produced all four varieties of iron ore, but the greater portion, 614,818 long tons, or 79.53 per cent, was magnetite, it occupying the first position in this class of ore, and supplying about one-half of the total amount mined in the United States in 1898. The bulk of the magnetite was obtained from the Cornwall Ore Hills by open-cut exploitation. Of the balance, 142,725 long tons, or 18.46 per cent, was brown hematite; 13,975 long tons, or 1.81 per cent, was red hematite, and 1,564 long tons, or 0.2 per cent, was carbonate.

The State has large reserves of ores, which, however, usually have lower iron contents than is now considered desirable. With the present demand for iron ores it is probable that some of the deposits which have been idle will resume operations, and that the 1899 production will show an advance over that of 1898.

TENNESSEE.

This State contributed, in 1898, 593,227 long tons of iron ore, being a decline of 11,270 tons, or 1.86 per cent from the 1897 total of 604,497 tons. Of the amount mined in 1898, 308,611 tons were brown hematite, and 284,616 tons red hematite. The greater portion of this ore was smelted in the blast furnaces of the State, but considerable brown hematite was supplied to furnaces in Northern Alabama.

VIRGINIA.

The blast furnaces of the State consume the iron ores mined in Virginia. The 1898 production, 557,713 long tons, shows a falling off of 153,415 tons, or 21.57 per cent from the 1897 output of 711,128 long tons. Nearly all of the ore mined in 1898 was brown hematite, in which class Virginia took first place with a total of 554,750 long tons; the balance, 2,963 tons, was red hematite.

WISCONSIN.

This State held seventh position in the year 1898, with an iron-ore production of 509,645 tons, all of the red hematite variety, in which class of ore it ranked fourth. This was a decline of 44,510 long tons, or 8.03 per cent, from the 1897 product of 554,155 long tons.

The major portion of the ore comes from the Menominee and Gogebic ranges, which extend into Wisconsin from Michigan, the latter State containing the greater portion of the deposits on both ranges. The balance was won from Dodge County, where there is an important deposit of fossil or "flaxseed" ore, which is quite easily wrought.

COLORADO.

Colorado's pig-iron industry showed a marked revival in the year 1898, and as a result the production of iron ore increased from 187,314 long tons in 1897 to 318,480 long tons in 1898, a gain of 131,166 long tons, or 70.02 per cent. All of this ore was not, however, used in the manufacture of pig iron, a considerable amount being utilized as a flux in the silver smelters.

Three different varieties of iron ore were produced—302,368 long tons, or 94.94 per cent, was brown hematite; 10,070 long tons, or 3.16 per cent, was red hematite, and 6,042 long tons, or 1.90 per cent, was magnetite.

NEW JERSEY.

The 275,438 long tons of iron ore mined in 1898 was all of the magnetite variety, in which class this State occupied second place. This was an advance of 21,203 long tons, or 8.34 per cent, over 1897.

New Jersey has important deposits of magnetite ore, but in many of the older mines the cost of winning, owing to moderate richness, increasing depth, narrow veins, and other causes, has made them unprofitable to operate. If, however, magnetic concentration is commercially successful, some of the leaner bodies of ore would again prove sources of supply for the Eastern furnaces, and deposits now unwrought may resume operations.

MISSOURI.

With the exception of a small amount of brown hematite iron ore which was used as a flux by the smelters, all of Missouri's production of 205,347 long tons in 1898 was of the red hematite variety. Most of the larger deposits have had the greater portion of the available iron ore removed, and a large portion of the product reported in 1898 is lean ore which was taken out in previous years but not considered as marketable without further treatment, and therefore not reported. This ore is now being utilized, and is therefore included in the present statement.

NEW YORK.

The production in this State in 1898 amounted to 179,951 long tons of iron ore, there having been for several years a gradual decline in the amount mined, due to the low cost at which Lake Superior ores have been delivered in the East, and to litigation in important mining companies. The 1898 output was 155,774 long tons, or 46 per cent less than that of 1897, which amounted to 335,725 long tons.

Four different varieties of iron ore were mined—155,551 long tons, or 86.44 per cent, was magnetite; 14,000 tons, or 7.78 per cent, brown hematite; 6,400 tons, or 3.56 per cent, red hematite; and 4,000 long tons, or 2.22 per cent, carbonate.

GEORGIA AND NORTH CAROLINA.

These States in the year 1898 produced 79,125 tons of red hematite ore, 78,869 long tons of brown hematite ore, and 2,089 tons of magnetite, a total of 160,083 long tons—a decrease of 44,556 long tons, or 21.77 per cent from the 1897 total of 204,639 long tons.

OTHER STATES.

None of the remaining States mined as much as 100,000 tons of iron ore. Ohio contributed 43,868 long tons of carbonate ore, ranking first as a producer of this class of ore; Massachusetts and Connecticut mined brown hematite ores; Kentucky, red hematite; Maryland, carbonate ore; Texas, brown hematite; while the States of Montana, New Mexico, Utah, Nevada, and Wyoming contributed red hematite, brown hematite, and magnetic ores.

The red hematite deposits in northeastern Wyoming give promise of a large development, arrangements having been perfected to supply these ores in large quantities to the blast furnaces and silver smelters of Colorado.

VALUE.

The total value of the 19,433,716 long tons of iron ore produced during the year ending December 31, 1898, was \$22,060,887, an average of \$1.14 per ton. This represents an advance of 6 cents over the average value in the year 1897, which was \$1.08 per ton. In the report for 1897 the advance in the price of ores, as fixed for 1898 by the Bessemer Ore Association, of Cleveland, was given as 15 cents per ton over the 1897 rates—an increase of 5.66 per cent—and the average increase for the country of 5.56 per cent in 1898 verifies this statement closely. It should be borne in mind that the prices given represent the value of the ore free on board cars or carts at the mine, and not the cost or the selling price of the ore. The royalty, if any, is, however, included.

The highest rates are obtained in the Western States, where iron ores are used as flux in precious metal smelters and where higher wages

prevail than in the East. The maximum average value was \$3.27 per ton in the States of Montana, New Mexico, Utah, and Wyoming. The lowest average, amounting to 40 cents per ton, was in Texas, where the ore was won by convict labor. The average in Michigan was \$1.41 per ton, while in Minnesota, where a longer haul is necessary to reach points of consumption and a lower price is paid for some of the iron ores, the average was 78 cents per ton at the mines.

The following table will show the production, total value, and value per ton, in the various States producing iron ore in the year ending December 31, 1898.

Production and value of iron ores in 1898.

State.	Production.	Total value.	Value per ton.
	<i>Long tons.</i>		
Michigan	7, 346, 846	\$10, 368, 807	\$1. 41
Minnesota	5, 963, 509	4, 659, 649	. 78
Alabama	2, 401, 748	1, 632, 208	. 68
Pennsylvania	773, 082	877, 365	1. 13
Tennessee	593, 227	481, 192	. 81
Virginia	557, 713	1, 226, 290	2. 20
Wisconsin	509, 645	687, 913	1. 35
Colorado	318, 480	553, 406	1. 74
New Jersey	275, 438	654, 148	2. 37
Missouri	205, 347	123, 345	. 60
New York	179, 951	350, 999	1. 95
Georgia and North Carolina	160, 083	129, 468	. 81
Montana, Nevada, New Mexico, Utah, and Wyoming	55, 969	183, 274	3. 27
Ohio	43, 868	50, 518	1. 15
Connecticut and Massachusetts	20, 251	53, 628	2. 65
Kentucky	12, 913	12, 913	1. 00
Texas	9, 705	3, 882	. 40
Maryland	5, 941	11, 882	2. 00
Total	19, 433, 716	22, 060, 887	1. 14

STOCKS.

The total stock of ore reported on hand at the mines December 31, 1898, was 2,846,457 long tons—a decrease of 251,830 long tons or 8.1 per cent from the amount on hand at the end of 1897, viz, 3,098,287 long tons.

The greater portion of the stocks are carried in the Lake Superior region, as nearly all of the ore is sent forward by vessels to lower lake ports, and after the close of navigation ore accumulates at the mines

until the lakes are again open to traffic. Michigan had 1,282,649 long tons of iron ore on hand December 31, 1898, or 45.1 per cent of the total, and the three States of Michigan, Minnesota, and Wisconsin together had stocks on hand December 31, 1898, amounting to 2,354,385 long tons, or 82.7 per cent of the total for the United States.

These stocks are at the mines and do not include the ore carried at the receiving docks on Lakes Erie and Michigan.

In the Southern States, as a rule, ore is not stocked, but is sent directly from the mines to the blast furnaces by rail, and as the distances are short the charges for carriage are much below those prevailing in the Lake Superior region, and shipments are made all through the year.

The following table shows the stocks of iron ore on hand at the mines in the various producing States at the end of the year 1898:

Stock of iron ores in 1898.

State.	Stock December 31, 1898.
	<i>Long tons.</i>
Michigan.....	1, 282, 649
Minnesota.....	943, 631
Missouri.....	^a 201, 253
Wisconsin.....	128, 105
New York.....	79, 096
New Jersey.....	71, 189
Pennsylvania.....	39, 690
Ohio.....	27, 000
Alabama.....	22, 355
Tennessee.....	15, 064
Texas.....	12, 900
Montana, Nevada, New Mexico, Wyoming, Utah, and Oregon.	7, 500
Virginia.....	6, 150
Connecticut, Massachusetts, and Vermont.....	3, 600
Kentucky.....	3, 000
Colorado.....	2, 950
Georgia and North Carolina.....	200
Maryland.....	125
Total.....	2, 846, 457

^a Including lean ores not previously reported. See data concerning Missouri production, p. 41.

The reports of stocks of iron ore on hand at the close of each year are usually made from records of the number of tram-car or skip loads of ore taken from the mines. When the stock pile is cleaned up this amount may be either greater or less than the actual tonnage, but on the average it is a close estimate. As an instance of the accuracy of

this method of figuring, one of the large iron ore-mining companies in the Lake Superior region (producing over one million and a quarter tons) had on hand at the end of December 31, 1897, a stock of ore amounting to almost 350,000 tons, and when this ore was finally cleaned up during the shipping season of 1898 the difference between the estimated and the actual amounts of ore in stock was but 3,800 tons, or one-third of 1 per cent of the total output of the operations.

PROMINENT IRON-ORE PRODUCERS.

The concentration of work upon limited areas and the exploitation on a liberal scale of large deposits results in a comparatively small number of mines contributing the bulk of the iron ores. Eighty-two mines, or groups of mines under one local management, produced 17,092,118 long tons of iron ore in 1898, equivalent to 208,440 long tons per mine on the average. The combined output of these 82 plants was 88 per cent of the total production for the year. Next to this record is that of 1897, when 85.64 per cent of the total iron ore mined was obtained from 73 of the larger mines.

Of the 82 prominent producers in 1898, 4 contributed between 600,000 and 700,000 long tons; 4 between 500,000 and 600,000 long tons; 5 between 400,000 and 500,000 long tons; 5 between 300,000 and 400,000 long tons; 11 between 200,000 and 300,000 long tons; 27 between 100,000 and 200,000 long tons; 26 between 50,000 and 100,000 long tons. Of these large mines, 35 were located in Michigan, 19 in Minnesota, 12 in Alabama, 1 in Pennsylvania, 3 in Wisconsin, 4 in Tennessee, 2 in Virginia, 3 in New Jersey, 1 in Georgia, 1 in Colorado, and 1 in New York.

Sixty-seven of these large mines produced red hematite, with a total of 15,293,794 long tons. Five mines supplied 843,957 long tons of magnetite; 9 contributed 810,584 tons of brown hematite, and the remaining mine yielded 143,783 long tons of a mixture of red hematite and magnetite.

The following list gives (by permission) the production at most of the mines which contributed 50,000 tons or over of iron ore in the year 1898, arranged in the order of their output:

List of prominent iron-ore producing mines of the United States in 1898.

Name of mine.	Production.
Norrie mines, Michigan:	<i>Long tons.</i>
Norrie.....	271,072
North Norrie	212,075
East Norrie.....	207,306
Lake Superior, Michigan.....	690,453
Mountain Iron and Rathbun, Minnesota.....	666,424
	650,021

List of prominent iron-ore producing mines of the United States in 1898—Continued.

Name of mine.	Production.
	<i>Long tons.</i>
Chandler, Minnesota.....	628,268
Fayal, Minnesota.....	590,500
Cornwall, Pennsylvania.....	584,341
Ishkooda and Spalding, Alabama.....	560,220
Mahoning, Minnesota.....	520,751
Adams, Minnesota.....	474,646
Chapin, Michigan.....	466,481
Cleveland Iron Mining Company, Michigan:	
Hard ore.....	10,797
Hematite.....	None.
Lake.....	444,903
	455,700
Lake Angeline, Michigan.....	442,500
Minnesota Iron Company, Minnesota.....	426,240
Biwabik, Minnesota.....	383,180
Tilden (Gogebic range), Michigan.....	378,723
Fossil, Muscado, and Wares, Alabama.....	375,756
Lone Jack and Missabe Mountain, Minnesota.....	349,763
Pewabic, Michigan.....	328,817
Aragon, Michigan.....	296,000
Genoa, Minnesota.....	282,064
Newport, Michigan.....	266,283
Ludington, Michigan.....	248,941
Montreal, Wisconsin.....	242,501
Auburn, Minnesota.....	235,631
Sparta, Minnesota.....	226,203
Cliffs Shaft, Michigan.....	205,495
Sloss, Alabama.....	201,247
Pabst, Michigan.....	198,741
Brown Mining Company, Tennessee.....	184,346
Penn Mining Company, Michigan.....	181,176
Franklin, Minnesota.....	150,591
Lawrence, Tennessee.....	144,368
Champion, Michigan.....	143,783
Aurora, Michigan.....	137,384
Crystal Falls, Michigan.....	131,492
Marquette, Ore (open pit), Michigan.....	122,765
Ashland, Michigan.....	122,107
Hull, Minnesota.....	121,758
Duluth, Minnesota.....	119,061
Commonwealth, Wisconsin.....	119,000
Pillsbury, Minnesota.....	116,500

List of prominent iron-ore producing mines of the United States in 1898—Continued.

Name of mine.	Production.
	<i>Long tons.</i>
Republic and West Republic, Michigan	114,872
Salisbury, Michigan	113,820
Irondale, Alabama	111,498
Norman, Minnesota	110,146
Alice, Alabama	104,544
Clifford, Alabama	104,430
Ohio, Minnesota	101,607
Redding, Alabama	89,805
Iron Belt, Wisconsin	89,629
Sellers, Minnesota	89,278
Cundy, Michigan	82,579
Clifton, Alabama	77,746
Hemlock River, Michigan	75,370
Allegheny Iron Company, Virginia	75,097
Brotherton, Michigan	73,719
Champion, Alabama	72,009
Wharton-Hibernia, New Jersey	71,936
Raimund, Alabama	66,293
Mansfield, Michigan	65,564
Embreville, Tennessee	65,000
Greeley, Alabama	57,282
Watts, Tennessee	52,988
Lower Wood, New Jersey	51,101
Tilden (Marquette range), Michigan	50,833
Total	15,137,367
Seventeen mines not reported by name	1,954,751
Grand total	17,092,118

TRANSPORTATION.

As has been previously stated, the greater portion of the ores from the Lake Superior region is shipped by water from the various upper lake ports to the receiving docks on Lake Erie and Lake Michigan. Of these shipping ports Escanaba, Michigan, which ranks first as regards the amount of iron ore sent by vessel in 1898, is situated on Lake Michigan, the ore sent from it (2,803,513 long tons) coming from the Menominee and Marquette ranges. Two Harbors, Minnesota, which ranks second, with a total shipment of 2,693,245 long tons, is 25 miles northeast of Duluth, and receives ore from the Vermilion and Mesabi ranges. Duluth, Minnesota, at the extreme western end of Lake Superior, depends upon the Mesabi range for its shipping ores, and in the year 1898, 2,630,610 long tons were sent to the lower lake

ports. From Ashland, Wisconsin, at the southern end of Chequamegon Bay, on the south shore of Lake Superior, 2,391,088 long tons were shipped in 1898 from the Gogebic range. Marquette, Michigan, on the southern shore of Lake Superior, the oldest of the lake shipping ports, in the last three years, owing to the completion of the Lake Superior and Ishpeming Railroad, has shown augmented shipments, those for 1898 being 2,245,973 long tons, all of which came from the Marquette range. Gladstone, Michigan, on Lake Michigan, and Superior, Wisconsin, on Lake Superior, also shipped the quantities of ore indicated below.

The following table will show that in 1898 all of the five larger shipping ports were closely grouped, the difference between the first and fifth being but 557,540 long tons. The table gives the shipments by ports from the years 1892 to 1898, inclusive, together with the amounts forwarded by railroad from the mines to the blast furnaces from 1892 to 1897:

Lake shipments of iron ore.

Shipping port.	1898.	1897.	1896.	1895.	1894.	1893.	1892.
	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>
Escanaba	2,803,513	2,302,121	2,321,931	2,860,172	1,644,776	2,048,681	4,010,085
Two Harbors	2,693,245	2,651,465	1,813,992	2,118,156	1,373,253	903,329	1,165,076
Duluth	2,630,610	2,376,064	1,988,932	1,598,783	1,369,252	440,592	.....
Ashland	2,391,088	2,067,637	1,566,236	2,350,219	1,738,590	1,117,520	2,223,684
Marquette	2,245,973	1,945,519	1,564,813	1,079,485	1,424,850	1,086,934	1,026,338
Superior	550,403	531,825	167,245	117,884	.....	80,273	4,245
Gladstone	335,956	341,014	220,887	169,211	79,108	203,589	115,886
Total	13,650,768	12,215,645	9,644,036	10,233,910	7,629,829	5,880,918	8,545,314
All-rail ship- ments .....	.....	241,357	290,792	195,127	118,394	178,037	525,768
Grand total .....	.....	12,457,002	9,934,828	10,429,037	7,748,223	6,058,955	9,071,082

Owing to the enlarged size of vessels, the necessity for rapidly loading them, etc., changes have been necessary in the construction of shipping docks, which have been heightened and their capacities increased.

The following table, giving the location, ownership, capacity, and dimensions of the shipping docks constructed to handle the iron ores mined in the Lake Superior region, has been furnished by Chief Engineer R. Angst, of the Duluth Iron Range Railroad. A comparison of this table with the one published in the report for the year 1895 will indicate some of the changes which have taken place.

Record of iron ore docks on the Great Lakes, April 1, 1899.

Railway.	Location.	Dock num-ber.	Number of pockets.	Storage capacity. Tons.	Height, water to center hinge-hole. Ft. In.	Height, water to deck of dock. Ft. In.	Width of dock outside partition posts. Ft. In.	Length of spouts. Ft. In.	Length of dock. Feet.	Angle of pockets. °	Remarks.
Chi. & Northwest'n Ry.	Escanaba, Mich.	1	184	24,104	28 10	48 6	37 0	21 0	1,104	39 30	Taken down February, 1888.
Do	do	2									
Do	do	3	226	30,284	31 2	52 8	37 0	27 0	1,356	45 00	312 feet single pockets; 1,076 feet double pockets.
Do	do	4	250	32,750	36 6	59 2	37 0	30 0	1,500	45 00	
Do	do	5	232	43,152	28 6	53 3	37 0	21 8	1,392	40 00	
Do	do	1	234	36,036	32 10	54 0	46 8	27 0	1,404	39 30	
Do	Ashland, Wis.	2	234	25,740	36 6	57 8	46 0	27 0	1,404	42 00	
Do	do	1	200	40,400	35 5	59 6	49 0	27 0	1,388	38 40	
Duluth & Iron Range R.R.	Two Harbors, Minn.	2	208	42,000	33 5	57 6	49 0	25 0	1,280	38 40	
Do	do	3	90	16,000	28 10	52 6	49 0	23 0	572	38 40	
Do	do	4	168	30,000	28 10	52 6	49 0	23 0	1,112	38 40	
Do	do	5	168	33,000	30 00	55 0	49 0	25 0	1,112	38 40	
Duluth, Missabe & Northern Ry.	St. Louis Bay, Duluth, Minn.	1	384	57,600	30 00	53 0	52 0	27 9	2,336	45 00	No. 3 dock not in use.
Do	do	2	384	69,120	32 00	57 6	52 0	27 9	2,336	45 00	
Duluth, South Shore and Atlantic Ry.	Marquette, Mich.	1	270	27,000	25 00	45 0	40 0	20 4	1,700	39 00	
Do	do	3	213	12,780	23 00	37 0	53 6	21 0	1,200	39 00	
Do	do	4	200	28,000	27 9	47 3	36 8	21 1	1,200	39 45	

Record of iron ore docks on the Great Lakes, April 1, 1899—Continued.

Railway.	Location.	Deck number.	Number of pockets.	Storage capacity.	Height, water to center of hinge-hole.	Height, water to deck of dock.	Width of dock outside partition posts.	Length of aprons.	Length of dock.	Angle of pockets.	Remarks.
Lake Superior and Ishpeming Ry. Duluth, Superior & Western Ry. Minneapolis, St. Paul & S. St. Marie Ry. Wisconsin Central	Marquette, Mich....	1	200	36,000	30 9	54 0	52 0	24 7	1,232	38 40	
	Allouez Bay, Superior, Wis.	1	250	40,500	32 00	57 0	49 8	27 2	1,525	45 00	Now Great Northern Ry.
	Gladstone, Mich....	1	120	15,000	26 8	47 0	37 0	21 8	752	40 00	
	Ashland, Wis.....	1	314	33,500	31 4	54 6	36 0	27 0	1,908	42 30 50 45	234 feet. 80 feet.

These extensive shipping docks permit of promptly and cheaply loading vessels with ore, and equally extensive and well-equipped receiving docks handle the ore from vessels at lower lake ports and at blast furnaces. The major portion of the iron ore—13,650,788 long tons—sent from upper lake ports, is forwarded to Lake Erie, 11,028,321 long tons being thus carried by vessel in 1898; the balance, 2,622,467 long tons, represents the amount which went to the coke blast furnaces at Chicago, Milwaukee, and adjacent territory and the charcoal blast furnaces in Michigan and Wisconsin.

The following table shows the receipts at lower lake ports from 1892 to 1898, inclusive, the latter being the year of maximum ore receipts:

Iron ore receipts at Lake Erie ports.

Ports.	1898.	1897.	1896.	1895.	1894.	1893.	1892.
	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons</i>	<i>Long tons</i>	<i>Long tons</i>	<i>Long tons</i>	<i>Long tons.</i>
Ashtabula, Ohio ...	2,684,563	3,001,914	2,272,822	2,474,791	1,987,722	1,845,738	2,556,416
Cleveland, Ohio ...	2,645,318	2,456,704	2,313,170	2,312,370	1,624,573	1,260,716	1,960,224
Conneaut, Ohio ...	1,404,160	495,327	327,623	244,967	237,905	203,207	1,130
Erie, Pa.	1,092,364	1,311,526	847,849	811,989	624,438	469,299	645,230
Buffalo (a) and Tonawanda, N.Y.	1,075,975	797,446	545,101	719,742	395,339	308,238	197,000
Fairport, Ohio	912,879	1,008,340	941,446	914,617	976,222	792,517	866,611
Lorain, Ohio	536,086	355,188	191,445	214,219	150,424	165,667	190,400
Toledo, Ohio	414,012	416,438	301,794	260,730	158,384	145,515	139,987
Sandusky, Ohio	136,200	79,792	58,667	12,361	23,043	4,464	49,736
Huron, Ohio	126,755	198,231	226,515	146,442	172,775	137,700	65,000
Total	11,028,321	10,120,906	8,026,432	8,112,228	6,350,825	5,333,061	6,660,784

a Buffalo alone in 1892.

The docks at the lower lake ports carry heavy stocks of mineral, which are to be taken into account when estimating the consumption of iron ore. Notwithstanding the fact that the largest amount of iron ore in the history of the business was sent from the upper lake ports in the year 1898, the amount on hand at the lower lake ports on December 1, 1898, was 5,136,407 long tons, a decrease of 787,348 long tons from the stock of December 1, 1897, which was 5,923,755 long tons. This demonstrates that all of the ore sent forward in the year 1898—11,028,321 long tons—went to furnaces, and, in addition, 787,348 long tons of the stocks had been shipped, making a total of 11,815,669 long tons (which may be considered as consumed). But the stocks on hand at the opening of navigation on May 1, 1899, were 2,073,254 long tons, a decrease of 1,094,661 tons during the winter months, which also went to supply blast furnaces.

The table below gives the stocks of ore at lower lake ports at the close of navigation, December 1, 1895, to December 1, 1898, and the

amounts on hand at the opening of navigation, May 1, 1896, to May 1, 1899:

Stocks of iron ore at lower lake ports.

Port.	At close of navigation, December 1.				At opening of navigation, May 1.			
	1895.	1896.	1897.	1898.	1896.	1897.	1898.	1899.
	<i>Long tons</i>	<i>Long tons</i>	<i>Long tons</i>	<i>Long tons</i>	<i>Long tons</i>	<i>Long tons</i>	<i>Long tons</i>	<i>Long tons</i>
Ashtabula.....	1,301,302	1,441,666	1,635,694	1,732,671	636,254	926,865	1,031,441	855,691
Cleveland.....	1,200,792	1,419,311	1,478,355	1,175,970	506,693	979,705	853,776	472,946
Fairport.....	605,470	773,905	825,312	719,794	346,847	430,984	501,592	289,417
Erie.....	335,718	355,222	484,871	439,167	137,826	153,261	236,485	95,626
Lorain.....	224,264	231,288	317,509	324,034	118,820	180,605	158,797	168,646
Conneaut.....	292,460	275,800	360,895	288,101	112,406	207,034	69,047	6,115
Toledo.....	113,132	115,959	194,644	146,568	10,593	66,337	71,726	22,915
Huron.....	101,000	200,075	230,029	139,982	55,173	162,292	143,170	82,055
Buffalo.....	207,199	82,267	111,660	121,620	16,644	50,477	53,081	72,757
Sandusky.....	84,375	59,491	84,786	48,500	8,442	43,937	43,800	7,086
Total.....	4,415,712	4,954,984	5,923,755	5,136,407	1,949,698	3,256,497	3,167,915	2,073,254

The total shipments from Lake Erie ports to blast furnaces, including the consumption by furnaces at Tonawanda, Buffalo, and Cleveland, which receive ore directly into their yards from vessels, was as follows for the years ending May 1 from 1891 to 1899, inclusive:

Total shipments of iron ore from lower lake ports to furnaces.

Year ending—	Quantity.	Year ending—	Quantity.
	<i>Long tons.</i>		<i>Long tons.</i>
May 1, 1899.....	12,122,982	May 1, 1894.....	4,840,488
May 1, 1898.....	10,209,488	May 1, 1893.....	6,102,125
May 1, 1897.....	6,719,633	May 1, 1892.....	5,802,496
May 1, 1896.....	8,805,510	May 1, 1891.....	5,148,669
May 1, 1895.....	6,297,215		

Loading directly from the vessels at lower lake ports into the railroad cars effects a saving of about 7 cents a ton, and the greater portion of the ore coming to the receiving docks is now forwarded at once to the blast furnaces, which have considerably increased their storage facilities. This results in a saving to the furnaces, the ore being handled more economically. Large stocks of ore are, however, carried at the lower lake ports, and the docks used for this purpose are of great size. A table of those at the five principal Lake Erie ports—Ashtabula,

Cleveland, Fairport, Erie, and Conneaut—which was prepared by Mr. E. B. Taylor, is given below:

Capacity of ore-receiving docks at the five principal Lake Erie ports.

Port.	Railroads which control the docks.	Aggregate length of dock face.	Character of machinery equipment.			Aggregate unloading capacity per day.	Total storage capacity, including freeties.
			McMyler.	Ore bridges.	Fast bolists.		
Ashtabula..	Pennsylvania lines; Lake Shore.	<i>Feet.</i> 11,350	19	66	18	<i>Tons.</i> 37,500	1,850,000
Cleveland..	Pennsylvania lines; Erie; Cleveland Terminal and Valley.	7,200	4	46	12	25,000	1,600,000
Fairport...	Pittsburg and Western.	5,500	18	17	.....	10,000	950,000
Erie	Pennsylvania lines.	4,368	6	13	12	13,000	750,000
Conneaut ..	Pittsburg, Bessemer and Lake Erie.	4,000	3	15	12	13,000	700,000
Total.....	.....	32,418	50	157	54	98,500	5,850,000

IMPORTS.

The following figures, supplied, as in former years, through the courtesy of the Chief of the Bureau of Statistics, United States Treasury Department, will show the imports of iron ore into the United States and the value of the ore, by countries and by customs districts, during the year ending December 31, 1898. Similar data for the years 1896 and 1897 are also presented.

The amount imported in 1898—187,208 tons—shows a falling off from the 1897 figures of 489,970 tons. This is a decrease of 302,762 tons, or 61.8 per cent.

The value of the 187,208 tons imported in 1898 was \$255,548, or \$1.37 per ton, a decrease of 2 cents from the 1897 value of \$1.39 per ton. It should be borne in mind, however, that the values given in this table are those at the port of shipment and do not include freight, etc.

Quantity and value of iron ores imported into the United States in 1896, 1897, and 1898.

Imported from—	1896.		1897.		1898.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	<i>Long tons.</i>		<i>Long tons.</i>		<i>Long tons.</i>	
Cuba	380,551	\$463,570	383,820	\$454,709	165,623	\$187,721
Spain	121,132	230,879	66,193	167,878	13,835	34,932
French Africa	79,661	163,517	3,504	7,785		
Italy	29,832	85,661				
Greece	33,750	34,520			7,200	26,581
Newfoundland and Labrador	20,800	20,965	29,250	29,431		
United Kingdom	8,528	23,155	358	4,091	683	5,385
Colombia	3,150	5,800				
Portugal	1,101	2,327	3,612	5,831		
Other countries	4,251	6,523	3,233	9,187	367	929
Total	682,806	1,036,917	489,970	678,912	187,208	255,548

The imports of iron ore by customs districts in 1896, 1897, and 1898 were as follows:

Imports of iron ore into the United States in 1896, 1897, and 1898, by customs districts.

Port.	1896.		1897.		1898.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	<i>Long tons.</i>		<i>Long tons.</i>		<i>Long tons.</i>	
Baltimore, Md	368,761	\$577,135	292,613	\$369,483	144,213	\$178,905
Philadelphia, Pa	308,217	444,687	194,814	302,211	42,861	74,226
New York, N. Y	4,199	10,499	309	1,272	119	1,815
Boston, Mass	78	216	46	112		
Newport News, Va					15	602
Total Atlantic ports	681,255	1,032,537	487,782	673,078	187,208	255,548
Cuyahoga, Ohio	1,033	1,911				
Champlain, N. Y			104	156		
Detroit, Mich	Not given	10	139	186		
Vermont			21	81		
Total Lake ports	1,033	1,921	264	423		
Paso del Norte (total Gulf ports)	257	159	919	2,525		
Puget Sound, Wash. (total Pacific ports)	126	350	1,000	2,826		
Pittsburg, Pa. (interior port)	135	1,950	5	60		
Total imports	682,806	1,036,917	489,970	678,912	187,208	255,548

EXPORTS.

The United States exports little iron ore, but in the year 1898 a considerable amount was shipped to Canada to supply a new blast furnace in the Province of Ontario, and a small quantity was sent to Mexico for use as flux in the silver smelters. The amount exported in 1898 was 31,579 long tons, valued at \$67,548.

The exports of iron ore in 1898, by customs districts, was as follows, the data being furnished by the Bureau of Statistics, United States Treasury Department:

Iron ore exportations from the United States in 1898, by customs districts.

Customs district.	Quantity.	Value.
	<i>Long tons.</i>	
Niagara	19,453	\$38,904
Duluth	4,210	12,630
Buffalo Creek	3,964	9,612
Superior	3,157	3,319
Saluria	596	2,320
Champlain	146	433
Paso del Norte	63	330
Total	31,579	67,548

Of the above ore 30,920 long tons, valued at \$64,898, was sent to Quebec and Ontario, etc., and 659 long tons, valued at \$2,650, was sent to Mexico. There has been no renewal of exportations of high-phosphorus magnetites from the Lake Champlain district to Germany for use in making steel by the basic process.

MONTANA IRON ORES.

Mr. Walter Harvey Weed has prepared an interesting review of the iron ores of Montana, from which the following excerpts are presented:

In the report of the Tenth Census, Vol. XV, page 472, mention is made of the existence of extensive deposits of iron ore in the mountains of Montana, notable among which is a mass of magnetic ore occurring in crystalline rocks on East Boulder Creek, Gallatin County, and a deposit in Lower Paleozoic quartzite in Cable Mountain, Deer Lodge County. The ore from the latter locality contains from 55 to 60 per cent metallic iron, is low in phosphorus and sulphur, and practically free from titanium. As soon as there is a sufficient demand for iron ore in Montana it will doubtless prove valuable.

Deposits of limonite and hematite are found in the Little Belt

Mountains, and the development work which has been done shows that they are of sufficient purity and extent to be workable, and that they may some day be utilized in Montana furnaces. The material is dense and hard, resisting erosion better than any of the rocks in the region, so that the float from such deposits is often quite noticeable in the drifts and gravels. In the Judith basin there occurs, in addition to the stratified rocks already mentioned, a narrow belt of granite, of width undetermined, accompanied by a band of magnetic iron ore. The ore is steel gray, strongly magnetic, except where in few instances exposure to atmospheric influences has altered it to limonite. It outcrops in heavy masses from one-half ton to 20 tons in weight, the outcrop varying in width from 2 feet to what would seem from the float to be at least 15 feet. The trend of the ore body is about N. 70° W. At one point on its course it was traced continuously for 3,000 feet. Magnetic iron ore is also reported on good authority in the Barker mining district. In the Judith Mountains, north of the Maiden mining camp, there is a limited amount of magnetic iron ore, together with a mass of bog ore (limonite).

From the general study made of the region it is evident that no general lead extends across the mountains, but that lenticular bodies of ore occur at the contacts of many of the masses of igneous rock. They were observed on Woodhurst Mountain; on Iron Creek, a branch of Lion Gulch; north of Yogo, on the mountain top above that place; and on Thunder Mountain. Iron-ore float was observed at other localities, and there seems little reason to doubt that it is of common occurrence about most of the larger igneous intrusions.

The Woodhurst Mountain deposits have, so far as known, been prospected only on the southeastern flank of the mountain, at the head of a small drainage way tributary to Galena Fork of Running Wolf Creek. The deposit has been opened by surface cuts, which expose a continuous mass of hematite in a trench 40 feet long, cut at right angles to the contact and hence across the lens. It lies at the base of a projecting tongue or offshoot of the porphyry body of Woodhurst Mountain, and is quite clearly a contact deposit. A partial analysis of the ore, made by Dr. W. F. Hillebrand, in the laboratory of the United States Geological Survey, gave Fe_2O_3 , 83.7; FeO , 6.4; Mn , none; TiO_2 , none; P_2O_5 , trace. The remainder is mostly silica. The ore is strongly magnetic, and is evidently a mixture of magnetite, hematite, and the hydrated oxides of iron.

This deposit is noted in Mineral Resources for 1888, in which two analyses by Professor Dodge, of the University of Minnesota, are given, which show somewhat higher iron contents. They are repeated as follows:

Analyses of iron ore from the Judith Mountain region, Montana.

Constituent.	Per cent.
Silica	2.37 to 3.58
Peroxide of iron	90.40 to 95.20
Lime	Trace to 1.02
Manganese	Trace to .20
Sulphur .....	.40
Phosphorus .....	.04 to .12
Water	6.31 to
Total	99.12 to 100.52
Metallic iron	63.28 to 66.64

A lens of quite pure hematite $2\frac{1}{2}$ feet thick was observed on the mountain ridge east of the head of Skunk Creek, near Yogo. The deposit occurs at the contact between limestones and a dark-colored coarsely-granulated rock (shonkinite). On the north side of Thunder Mountain, at the head of Iron Creek, at an altitude of 6,000 feet, the contact between the porphyry and the sedimentary rocks is marked by lenses of iron ore. The sedimentary rocks are locally baked and metamorphosed, the soft micaceous Cambrian shales being changed to hard, flinty hornstones. The iron ore is, in part at least, a replacement of these rocks and occurs between them and the granite porphyry, in lenses varying from a few feet to 20 feet in thickness, but whose lateral extent is not exposed by outcrops or by the openings thus far made. The ore is at present exposed in an open cut, and the quantity appears to warrant mining, if a demand should arise for it, since it could be easily transported by some gravity system to the railroad. Analyses of the ore show: Fe_2O_3 , 76.96; FeO , 0.03; Mn , 0.08; SiO_2 , 8.80; Al_2O_3 , 0.74; S , 0.03; H_2O , 13.36.¹ From the analyses it would appear that the ore is a fairly pure limonite mixed with a little quartz, but it is magnetic, and hence must be a mixture of magnetite with limonite derived from it. Openings along the contact on the southern side of the mountain also showed iron ores.

In Fergus County the Judith Mountains, which rise so abruptly from the open plains country of the central portion of the State, exhibit large amounts of bog-iron ore, deposited apparently from spring waters. There are also small contact deposits of the usual mixture of magnetite and limonite. In the neighboring Moccasin Mountains a deposit of considerable magnitude was observed by the writer. It occurs at the contact of the lacolithic mass of porphyry, which has been intruded between the sedimentary beds and which has lifted them up as a broad dome. This ore is also magnetic.

In Jefferson County several deposits of iron ore occur at localities

¹ The absence of phosphorus determination is noticeable.

favorable for working. The largest is that found at the west base of Jack Mountain, where the bright-red ore forms a small butte rising above the general slope.

Near Elkhorn, on the summit of the peak by that name, there is a large body of magnetite-limonite ore that is extensively opened by surface cuts. The mine is accessible from the railroad by a graded wagon road about 6 miles long and all down grade from the workings. A few carloads of ore have been shipped, used, it is understood, as a flux by the silver smelter. The ore appears to be a contact deposit between andesite and granite with the sedimentary rocks.

On Fox Mountain, west of Bernice Station, on the Great Northern Railway, a deposit of iron ore has been opened by prospect trenches and shallow pits. The property, commonly called the Calvin mine, is $3\frac{1}{2}$ miles west of and at an elevation of about 1,100 feet above the railway, and is accessible by wagon road. The ore occurs in sintery or stalactitic botryoidal forms. It is not magnetic in the specimens seen, and it gives a brown streak. Samples of the ore have been assayed and analyzed with the following results:

Analysis of iron ore from Fox Mountain, Montana.

Constituent.	Per cent.
Silica	6.36
Oxide of iron	86.07
Alumina	1.35
Manganese	Trace.
Antimony	0.92
Arsenic	Trace.
Lime	0.34
Magnesia	Trace.
Phosphoric acid	0.214
Sulphur	0.41
Loss on ignition, moisture	3.60
Alkalies and undetermined	1.105
Total	100.369
Metallic iron	60.25

The small amount of antimony, reported as metallic, probably occurs as antimonide of iron, and is of very rare occurrence in ores of this class.

The assay value is as follows:

Gold, 0.11 ounce per ton	\$2.20
Silver, 1.19 ounce per ton .....	.72
Total	2.92

In Meagher County, on Warm Spring Creek, ferruginous sandstones, associated with lignites, were quarried for fluxing for a short time. They are too siliceous to be valuable. In Beaverhead County iron ore has, it is said, been extensively mined for many years. In Cascade County carbonate ores occur interstratified with the shales of the coal formation (Lower Cretaceous), but do not occur in workable deposits. They are noted and analyses are given in Mineral Resources for 1888, page 34.

The iron ores of the State have thus far been used only as a flux for silver smelting, no pig iron being made. The production credited to Montana in the report of the Eleventh Census (1889) is 24,072 tons. In 1891 the production was 8,536 tons of red hematite and 4,000 tons of brown hematite, which decreased to 4,900 tons of red hematite and 2,170 tons of brown hematite in 1892. In subsequent years the production has been grouped with that of other States in the figures published by the U. S. Geological Survey.

STATISTICS OF THE AMERICAN IRON TRADE FOR 1898¹

By JAMES M. SWANK,
General Manager of the American Iron and Steel Association.

GENERAL REVIEW OF THE DOMESTIC IRON TRADE.

The industrial situation in this country as it presented itself in September, 1898, we thus summed up: "In the period that has elapsed since the Dingley tariff became a law there has been greater industrial activity in this country than in any other period of twelve months since 1892. In all manufacturing lines there has been an increased demand for manufactured products and more general employment of labor. But the revival of industrial activity which followed the enactment of the new tariff was greatly promoted by the fortuitous circumstance that there was an extraordinary foreign demand in 1897 for our agricultural products, which has continued in 1898." In the general improvement in business in 1897 and 1898 which is here noted the iron and steel industries of the United States had fully shared. There was an increased demand for iron and steel.

This was the industrial situation in our country nine months ago. The favorable conditions which then existed have continued to the present time and have become more and more favorable as the days have passed. The demand for manufactured articles has steadily increased; the foreign demand for our surplus agricultural products has been well maintained; the carrying capacity of the railroads has been taxed to the utmost; prices generally have risen and wages have advanced.

In the iron trade prices began to advance in December, 1898, and they continued to advance slowly but steadily in January and the early part of February of the present year. In the latter part of February this conservative advance was succeeded by excited markets, which

¹To hasten the publication of the very important statistics of the American iron trade for 1898 it has been deemed advisable to present these statistics, with introductory comments, largely in the form of extracts from the Annual Statistical Report of the American Iron and Steel Association, which has just been printed. All details that have special interest for iron and steel manufacturers, but not for the general public, have been omitted from the compilation which follows. Prominence is given to the details of our greatly increased export trade in iron and steel.

condition lasted until the latter part of March, when prices became stationary. In May and June prices were again advanced. Until the advance took place in December Bessemer pig iron at Pittsburg ranged throughout the year from \$9.75 to \$10.50, Bessemer billets at Pittsburg from \$14.75 to \$16, and steel rails at Pennsylvania mills from \$17 to \$18; other prices showed similar narrow fluctuations. But from December, 1898, to March, 1899, prices advanced as follows: Bessemer pig iron at Pittsburg to \$15.65, Bessemer billets at Pittsburg to \$25.50, and steel rails at Pennsylvania mills to \$26. On June 15 the prices were as follows: Bessemer pig iron at Pittsburg, \$18.65; Bessemer billets at Pittsburg, \$33.50; steel rails at Pennsylvania mills, \$30.

Coincidentally with the advance in iron and steel prices, particularly after the advance in February, the wages of iron and steel workingmen which did not rest on a sliding scale were voluntarily increased by the manufacturers. This increase represents to-day an addition of about 25 per cent to the wages previously paid. There has been no serious strike for higher wages in the iron trade recently, and there have been few strikes of any kind in the iron trade since 1892.

While the controlling influences in restoring complete prosperity to our country have been the settlement of the tariff question and the foreign demand for our surplus crops of 1897 and 1898, there have been other favorable influences that should not be overlooked. The low prices of our manufactured products which have prevailed for several years, coupled with the superior character of these products and the enterprise of our manufacturers, have enabled us to send constantly increasing quantities of these products to foreign markets, iron and steel and manufactures of iron and steel being especially prominent in this increase in our export trade, while the low prices referred to have also greatly reduced our imports of manufactured goods. Increased exports and decreased imports of manufactured goods have cooperated with the increased foreign demand for our agricultural products to greatly increase our previously favorable balance of trade.

Instead of sending our gold abroad to pay for the products of foreign workshops, other countries have sent us large quantities of their own gold in 1897 and 1898 to pay for the products of American workshops and American farms. Furthermore, the Spanish war of 1898, like all destructive wars, had a stimulating effect upon the business activity of the country by creating a demand for supplies for the army and navy, this demand putting in circulation hundreds of millions of dollars. We have had, therefore, from our improved balance of trade and the Spanish war a great increase in the amount of money in actual circulation in our country, which fact of itself, independently of the causes that have created this condition, could have only a beneficial effect upon general business, by stimulating enterprise, enhancing prices, and increasing wages. It is officially stated that the per capita circulation of money on April 1 of the present year was \$25.45,

against \$23.69 on April 1, 1898, \$23.01 on April 1, 1897, and \$21.53 on April 1, 1896.

Referring more particularly to the course of the iron trade since the beginning of better times in 1897 the enormous production of iron and steel in 1898 and thus far in 1899 is of first importance. In 1898 we made more pig iron than in any previous year, more Bessemer steel, and more open-hearth steel, and rolled more wire rods, more structural steel, more plates and sheets, and, with the single exception of the year 1887, more steel rails.

Our export trade in iron and steel and manufactures of iron and steel aggregated in value in 1898 \$82,771,550, against \$62,737,250 in 1897 and \$48,670,218 in 1896, showing an increase in two years of more than 70 per cent. Included in the exports of 1898 were 253,057 tons of pig iron, 291,038 tons of steel rails, 28,600 tons of ingots, blooms, and billets, 18,510 tons of steel wire rods and 24,195 tons of other steel rods and bars, 27,075 tons of steel plates and sheets, 74,665 tons of wire, 15,735 tons of cut nails and spikes, 13,714 tons of wire nails and spikes, and 34,038 tons of structural iron and steel. We also sent abroad in the same year 580 locomotives. Other exports embraced large shipments of machinery composed mainly or wholly of iron and steel. Agricultural implements are not included in the above figures. Of these the exports in 1898 amounted to \$9,073,384, against \$5,302,807 in 1897 and \$4,643,729 in 1896.

Our imports of iron and steel have greatly declined in late years. With the exception of tin plates, the importation of which is encouraged by an objectionable drawback provision in our tariff legislation, we now import very few of the products of European iron and steel works. In 1898 our total imports of iron and steel and manufactures of iron and steel amounted in foreign value to \$12,473,637, against \$13,836,204 in 1897, \$19,462,561 in 1896, and \$25,772,136 in 1895. Prior to 1895 our average annual importations of iron and steel from 1871, a period of twenty-four years, amounted to \$42,826,681 in foreign value.

In 1880 this country imported iron and steel and manufactures of iron and steel valued at \$80,443,362, and exported like articles of the value of \$15,156,703. In 1898, as stated above, we exported iron and steel and manufactures of iron and steel valued at \$82,771,550, and imported like articles valued at \$12,473,637, thus completely reversing the conditions of nineteen years ago.

An interesting feature of our foreign iron trade is disclosed by a careful examination of the statistics of our imports of iron and steel and manufactures of iron and steel from Great Britain and our exports of like articles to the same country. These statistics show that our imports of iron and steel and manufactures of iron and steel from Great Britain in the fiscal year ending June 30, 1898, including tin plates, amounted in value to \$8,369,866, and that our exports to Great Britain in the same fiscal year amounted to \$12,752,016. The weight of all the

articles, both imported and exported, is not a matter of record, but, considering only those articles imported from Great Britain in 1898 which were weighed, tin plates included, and the articles weighed and exported in the same year from this country to Great Britain, we find that we imported 119,189 long tons and exported 118,232 tons. Only a few years ago this country was Great Britain's principal customer for iron and steel, but now we sell to her in her own home markets virtually as many tons of iron and steel as she sells to us.

GENERAL STATISTICAL SUMMARY.

In 1898 the United States made 11,773,934 long tons of pig iron, 6,609,017 tons of Bessemer steel ingots, 2,230,292 tons of open-hearth steel, and 8,932,857 tons of steel of all kinds, and rolled in all 8,513,370 tons of finished iron and steel, including rails; there were also shipped in the same year 14,029,682 long tons of Lake Superior iron ore and 8,460,112 short tons of Connellsville coke. The following table gives the shipments of Lake Superior iron ore and Connellsville coke and the production of leading articles of iron and steel in 1898 and 1897:

Production of leading articles of iron and steel in 1898 compared with 1897.

Article (long tons, except coke and nails). ^a	1897.	1898.
Shipments of iron ore from Lake Superior.....	12, 463, 793	14, 029, 682
Shipments of Connellsville coke, in short tons..	6, 915, 052	8, 460, 112
Production of pig iron, including spiegel and ferromanganese	9, 652, 680	11, 773, 934
Production of spiegeleisen and ferromanganese..	173, 695	213, 769
Production of Bessemer-steel ingots and castings	5, 475, 315	6, 609, 017
Production of open-hearth steel ingots and castings	1, 608, 671	2, 230, 292
Production of all kinds of steel.....	7, 156, 957	8, 932, 857
Production of structural shapes, not including plates	583, 790	702, 197
Production of plates and sheets, except nail plate.....	1, 207, 286	1, 448, 301
Production of all rolled iron and steel, except rails	5, 353, 836	6, 532, 129
Production of Bessemer-steel rails	1, 644, 520	1, 976, 702
Production of all kinds of rails.....	1, 647, 892	1, 981, 241
Production of street rails, included above.....	122, 244	143, 815
Production of iron and steel wire rods	970, 736	1, 071, 683
Production of all rolled iron and steel, including rails.....	7, 001, 728	8, 513, 370
Production of iron and steel cut nails, in kegs..	2, 106, 799	1, 572, 221
Production of iron and steel wire nails, in kegs.	8, 997, 245	7, 418, 475

^a The long ton represents 2,240 pounds and the short ton 2,000 pounds.

The shipments of Lake Superior iron ore increased 1,565,889 tons as compared with the shipments of 1897, or over 12 per cent, and the shipments of Connellsville coke increased 1,545,060 tons, or over 22 per cent. The production of pig iron increased 2,121,254 tons, or almost 22 per cent; spiegeleisen and ferromanganese, 40,074 tons, or over 23 per cent; Bessemer-steel ingots, 1,133,702 tons, or over 20 per cent; open-hearth steel ingots and castings, 621,621 tons, or over 38 per cent; all kinds of steel, 1,775,900 tons, or over 24 per cent; structural shapes, 118,407 tons, or over 20 per cent; plates and sheets, 241,015 tons, or almost 20 per cent; Bessemer-steel rails, 332,182 tons, or over 20 per cent; wire rods, 100,947 tons, or over 10 per cent, and all rolled iron and steel, including rails, 1,511,642 tons, or over 21 per cent. There was a decrease in the production of iron and steel cut nails in 1898, as compared with 1897, of 534,578 kegs, or over 25 per cent, and in iron and steel wire nails of 1,578,770 kegs, or over 17 per cent.

AVERAGE MONTHLY PRICES OF IRON AND STEEL.

In the following table we give the average monthly prices of various leading articles of iron and steel in Pennsylvania in 1896, 1897, and 1898, and in the first five months of 1899. The prices named are per long ton of 2,240 pounds, except for bar iron, which is per 100 pounds:

Average monthly prices of iron and steel from January, 1896, to May, 1899.

Month.	Old iron T rails, at Philadelphia.	No. 1 foundry pig iron, at Philadelphia.	Gray forge pig iron, at Philadelphia.	Gray forge pig iron, Lake ore, at Pittsburgh.	Bessemer pig iron, at Pittsburgh.	Steel rails, at mills, in Pennsylvania.	Steel billets, at mills, at Pittsburgh.	Best refined bar iron, from stores, at Philadelphia.	Best refined bar iron, at Pittsburgh.
	Per long ton.	Per long ton.	Per long ton.	Per long ton.	Per long ton.	Per long ton.	Per long ton.	Per 100 lbs.	Per 100 lbs.
January, 1896.	\$14.25	\$13.56	\$11.55	\$10.90	\$11.81	\$28.00	\$16.60	\$1.45	\$1.25
February	14.75	13.50	11.50	11.00	12.95	28.00	17.69	1.40	1.25
March	15.00	13.45	11.30	10.92	12.25	28.00	17.19	1.35	1.21
April	14.87	13.25	11.19	10.85	13.32	28.00	19.80	1.40	1.20
May	14.43	12.83	11.00	10.79	12.83	28.00	19.55	1.40	1.20
June	11.00	12.75	11.00	10.62	12.47	28.00	19.42	1.40	1.20
July	14.00	12.75	10.90	10.37	12.12	28.00	19.50	1.40	1.20
August	14.00	12.75	10.75	9.63	10.91	28.00	19.22	1.40	1.20
September	13.50	12.50	10.75	9.50	11.31	28.00	19.41	1.40	1.20
October	12.75	12.56	10.81	9.87	11.71	28.00	19.73	1.40	1.20
November	13.94	12.81	11.12	10.34	12.46	28.00	19.89	1.40	1.22
December	14.50	12.75	11.25	9.94	11.54	28.00	18.00	1.40	1.25

Average monthly prices of iron and steel from January, 1896, to May, 1899—Continued.

Month.	Old iron T rails, at Philadelphia.	No. 1 foundry pig iron, at Philadelphia.	Gray forge pig iron, at Philadelphia.	Gray forge pig iron, Lake ore, at Pittsburgh.	Bessemer pig iron, at Pittsburgh.	Steel rails, at mills, in Pennsylvania.	Steel billets, at mills, at Pittsburgh.	Best refined bar iron, from store, at Philadelphia.	Best refined bar iron, at Pittsburgh.
	<i>Per long ton.</i>	<i>Per long ton.</i>	<i>Per long ton.</i>	<i>Per long ton.</i>	<i>Per long ton.</i>	<i>Per long ton.</i>	<i>Per long ton.</i>	<i>Per 100 lbs.</i>	<i>Per 100 lbs.</i>
January, 1897.	\$14.00	\$12.75	\$11.06	\$9.66	\$10.77	\$25.00	\$15.90	\$1.40	\$1.22
February	13.87	12.75	11.00	9.54	10.72	20.00	15.50	1.40	1.20
March	12.60	12.60	10.65	9.41	10.57	18.00	15.62	1.40	1.20
April	11.62	12.12	10.50	8.85	9.91	18.00	14.65	1.25	1.14
May	11.50	11.87	10.25	8.70	9.52	18.00	13.96	1.25	1.04
June	11.50	11.75	10.10	8.36	9.74	18.00	14.12	1.25	.99
July	11.50	11.75	10.19	8.36	9.39	18.00	14.00	1.25	.95
August	11.55	11.75	10.05	8.29	9.54	18.00	14.29	1.25	.99
September ...	12.25	11.87	10.50	8.85	10.04	18.00	15.50	1.25	1.07
October	13.69	12.00	10.50	9.75	10.70	18.00	16.55	1.35	1.15
November	13.15	12.00	10.50	9.56	10.52	18.00	15.87	1.35	1.15
December	12.67	12.00	10.50	9.00	10.09	18.00	15.00	1.35	1.15
January, 1898.	12.50	12.00	10.37	9.00	10.00	18.00	15.00	1.40	1.15
February	12.50	11.87	10.25	8.97	10.06	18.00	15.12	1.35	1.15
March	12.50	11.75	10.25	9.06	10.37	18.00	15.37	1.35	1.05
April	12.44	11.75	10.25	9.22	10.35	18.00	15.30	1.25	1.05
May	12.00	11.65	10.25	9.12	10.41	18.00	14.94	1.25	1.05
June	12.00	11.44	10.25	9.14	10.42	17.50	14.75	1.25	1.05
July	12.00	11.25	10.25	9.11	10.31	17.00	14.75	1.25	1.05
August	12.05	11.30	10.25	9.19	10.35	17.50	15.62	1.25	1.05
September ...	12.50	11.50	10.19	9.36	10.45	17.50	16.00	1.25	1.08
October	12.50	11.70	10.00	9.33	10.40	17.50	15.80	1.25	1.10
November	12.70	11.75	10.00	9.24	10.22	17.00	15.12	1.25	1.04
December	12.94	11.97	10.41	9.46	10.64	17.50	15.90	1.25	1.00
January, 1899.	13.30	12.12	10.75	9.89	11.00	18.50	17.06	1.30	1.12
February	14.16	13.25	11.69	10.87	11.69	20.25	18.87	1.45	1.22
March	16.87	16.00	14.37	13.29	14.77	24.80	24.25	1.70	1.38
April	17.87	16.50	15.00	14.50	15.06	25.75	25.25	1.75	1.65
May	18.00	16.60	15.30	15.07	16.32	25.00	27.60	1.88	1.75

PRICES OF LAKE SUPERIOR IRON ORE.

We give below the prices at which Lake Superior iron ore has been sold upon season contracts in 1897 and 1898, per long ton, delivered at lower ports on Lake Erie; also the prices at which sales were made early in 1899 for season delivery. These prices have been furnished by Mr. A. I. Findley, editor of the Iron Trade Review, of Cleveland.

Prices of Lake Superior iron ore in 1897, 1898, and 1899.

Grade.	1897.	1898.	1899.
Mesabi Bessemer	\$2.10@ \$2.30	\$2.15@ \$2.25	\$2.25@ \$2.40
Mesabi non-Bessemer	1.80@ 2.00	1.70@ 1.85	1.90@ 2.10
Marquette specular No. 1 Bessemer	2.80@ 3.10	3.10@ 3.35	3.21@ 3.50
Marquette specular No. 1 non-Bessemer	2.45	2.35@ 2.45	2.50
Chapin	2.40	2.56	2.73½
Soft hematites, No. 1 non-Bessemer	2.25	1.80@ 2.00	2.00@ 2.15
Gogebic, Marquette, and Menominee No. 1 Bessemer hematites	2.65@ 2.85	2.75@ 2.95	2.80@ 3.25
Minnesota No. 1 hard Bessemer	3.11	3.36	3.58
Minnesota No. 1 hard non-Bessemer	2.65	2.50	2.65
Chandler No. 1 Bessemer	2.92½	3.13	3.35
Marquette extra low phos. Bessemer	3.42@ 3.46	3.65	3.85@ 3.90

The bulk of the ore sold for season delivery in 1899 was sold in January. Soon afterwards the rapid advance in the prices of pig iron and finished material caused sales to be made at prices ranging from 50 cents to 75 cents per ton above the opening prices, Biwabik, for example, selling at \$3 per ton, whereas opening sales were made at \$2.40. Some lots of ore were held late in April at 90 cents and \$1 per ton above the opening prices.

IMPORTS OF IRON ORE.

The following table, for which we are indebted to the Bureau of Statistics of the Treasury Department, gives the quantities and values of iron ore imported into the United States during the calendar years 1896, 1897, and 1898, by customs districts:

Imports of iron ore for three years, 1896, 1897, and 1898.

District.	1896.		1897.		1898.	
	Long tons.	Value.	Long tons.	Value.	Long tons.	Value.
Baltimore	368, 761	\$577, 135	292, 613	\$369, 483	143, 925	\$177, 764
New York	4, 199	10, 502	309	1, 272	239	2, 143
Philadelphia ...	308, 217	444, 687	194, 814	302, 211	42, 861	74, 226
Puget Sound ...	126	350	1, 919	5, 351		
Vermont	35	132	21	81	29	113
All other	1, 468	4, 111	294	514	154	1, 302
Total	682, 806	1, 036, 917	489, 970	678, 912	187, 208	255, 548

The imports of Cuban iron ore into the United States from 1884 to 1898, included above, were as follows. Owing to the war with Spain the mines were in operation for only a part of 1898.

Imports of iron ore from Cuba into the United States from 1884 to 1898.

Year.	Long tons.	Year.	Long tons.	Year.	Long tons.
1884	21, 798	1889	256, 278	1894	150, 439
1885	81, 106	1890	362, 068	1895	386, 044
1886	111, 710	1891	266, 377	1896	409, 883
1887	97, 711	1892	330, 357	1897	397, 173
1888	198, 048	1893	362, 685	1898	164, 077

During 1898 the Juragua Iron Company Limited exported to the United States 83,852 long tons of iron ore from its Cuban mines, which was a decrease of 160,965 tons as compared with its total exports in 1897. All the ore exported by this company in 1898 was sent to the United States in 27 cargoes and was received at the port of Baltimore. The total exports of iron ore by this company to the United States from 1884 to the close of 1898 amounted to 3,154,747 tons, shipped in 1,128 cargoes. In addition, 2 cargoes, containing 5,932 tons, were exported to Nova Scotia in 1897, making the total exports amount to 3,160,679 tons.

The Spanish-American Iron Company first commenced shipping iron ore from its Cuban mines in 1895, 74,992 long tons having been sent to

the United States in that year. In 1896 the shipments to the United States amounted to 111,584 tons, in 1897 to 152,356 tons, and in 1898 to 80,225 tons, of which latter 28,933 tons were received at Philadelphia and 51,292 tons at Baltimore. The same company shipped 51,537 tons of ore to foreign countries in 1897, but in 1898 no foreign shipments were made.

No iron ore was shipped in 1894, 1895, 1896, 1897, or 1898 from the Cuban mines of the Sigua Iron Company. This company exported 14,022 long tons of iron ore in 1893 and 7,830 tons in 1892, when its first shipments were made.

LAKE SUPERIOR IRON-ORE SHIPMENTS.

The following table, for which we are indebted to Mr. George A. Newett, the editor of the *Ishpeming Iron Ore*, gives the shipments of iron ore from the mines of the Lake Superior region in the last five years. The figures include shipments to local furnaces and all shipments by rail and water to other consumers.

Lake Superior iron-ore shipments, 1894 to 1898.

District.	1894.	1895.	1896.	1897.	1898.
	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>
Marquette range, Michigan.	2,058,683	2,095,166	2,605,152	2,711,505	3,125,039
Menominee range, Michigan and Wisconsin.....	1,139,273	1,926,203	1,538,238	1,935,669	2,527,274
Gogebic range, Michigan and Wisconsin.....	1,810,290	2,560,765	1,799,884	2,257,274	2,498,461
Vermilion Lake, Minnesota.	948,514	1,077,838	1,088,389	1,278,482	1,265,142
Mesabi range, Minnesota....	1,792,172	2,778,296	2,884,372	4,280,863	4,613,766
Total.....	7,748,932	10,438,268	9,916,035	12,463,793	14,029,682

The Lake Superior mines which shipped the largest quantities of iron ore in 1898 were the following: The Norrie mines, in the Gogebic range; 700,990 tons; Chapin, in the Menominee range, 724,768 tons; Lake Angeline, in the Marquette range, 460,333 tons; Lake Superior, in the Marquette range, 686,583 tons; Cleveland-Cliffs, in the Marquette range, 869,482 tons; Mountain Iron, in the Mesabi range, 650,955 tons; and Fayal, in the Mesabi range, 575,933 tons.

In 1898 lake shipments were made from the following ports: Marquette, 2,245,965 long tons; Escanaba, 2,803,513 tons; Gladstone, 335,956 tons; Ashland, 2,391,088 tons; Two Harbors, 2,693,245 tons; Duluth, 2,635,262 tons; Superior, 550,403 tons; total by lake, 13,655,432 tons; all-rail shipments, 374,250 tons: total shipments in 1898, 14,029,682 tons.

RECEIPTS OF IRON ORE AT LAKE ERIE PORTS.

The Iron Trade Review annually publishes the statistics of the receipts of Lake Superior iron ore at Cleveland and other ports on Lake Erie, the ports of Buffalo and Erie included, the principal receipts being at Ashtabula and Cleveland; also the quantity left on the docks at the close of navigation. From these statistics we compile the following summary of the receipts at all Lake Erie ports from 1885 to 1898 and of the stocks on dock at the close of navigation in each of these years:

Receipts of iron ore at Lake Erie ports.

Year.	Receipts.	On dock.	Year.	Receipts.	On dock.
	<i>Long tons.</i>	<i>Long tons.</i>		<i>Long tons.</i>	<i>Long tons.</i>
1885.....	1,503,969	1,048,940	1892.....	6,660,734	4,149,451
1886.	2,270,554	966,472	1893.....	5,333,061	4,070,710
1887.....	3,439,198	1,558,861	1894.....	6,350,825	4,834,247
1888.....	3,783,659	1,848,555	1895.....	8,112,228	4,415,712
1889.....	5,856,344	2,607,106	1896.....	8,026,432	4,954,984
1890.....	6,874,664	3,893,487	1897.....	10,120,906	5,923,755
1891.....	4,939,684	3,508,489	1898.....	11,028,321	5,136,407

The receipts of Lake Superior iron ore at the ports of Buffalo (including Tonawanda), Erie, and Conneaut in the last seven years are given by the Review as follows:

Receipts of Lake Superior iron ore at Buffalo (including Tonawanda), Erie, and Conneaut from 1892 to 1898.

Port.	1892.	1893.	1894.	1895.	1896.	1897.	1898.
	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>
Buffalo....	197,000	308,238	395,339	719,742	545,101	797,446	1,075,975
Erie	645,230	469,299	624,438	811,989	847,849	1,311,526	1,092,364
Conneaut .	1,130	203,207	237,905	244,967	327,623	495,327	1,404,169
Total	843,360	980,744	1,257,682	1,776,698	1,720,573	2,604,299	3,572,508

CONSUMPTION OF IRON ORE.

We estimate our total consumption of iron ore in 1898 at 21,193,000 long tons, against 17,375,000 tons in 1897, 15,525,000 tons in 1896, 17,253,000 tons in 1895, 12,235,000 tons in 1894, 13,480,000 tons in 1893, 17,400,000 tons in 1892, and 15,740,000 tons in 1891. Our imports of iron ore in 1898 amounted to 187,208 long tons. This quantity subtracted from the quantity consumed leaves 21,005,792 tons as the probable consumption of domestic iron ore in 1898, against 16,885,030 tons in 1897, 14,842,194 tons in 1896, 16,728,847 tons in 1895, 12,067,693 tons in 1894, 12,953,049 tons in 1893, and 16,593,415 tons in 1892.

IMPORTS OF MANGANESE ORE FROM CUBA.

Mines of manganese ore of great extent and richness were opened in the interior of the province of Santiago de Cuba a few years ago, and a branch railroad was built which connected them with a railroad to the coast. One cargo of ore was shipped to the United States before the breaking out of the Cuban insurrection in 1895, when operations were stopped until peace should be restored. The mines are situated at Ponupo, and the company operating them is styled the Ponupo Iron Company, all the stockholders being citizens of Pennsylvania. Since the termination of our war with Spain in 1898 the company has shipped over 3,000 tons of manganese ore to the United States.

IMPORTS OF IRON AND STEEL.

The following table, which has been compiled from statistics furnished by the Bureau of Statistics of the Treasury Department, gives the quantities and values of our imports of iron and steel and manufactures thereof in the calendar years 1897 and 1898:

Imports of iron and steel in 1897 and in 1898.

Article.	1897.		1898.	
	Long tons.	Value.	Long tons.	Value.
Pig iron, spiegeleisen, and ferro-manganese	19,212	\$484,655	25,137	\$703,829
Scrap iron and scrap steel ..	1,549	12,433	1,783	33,330
Bar iron	13,264	614,323	19,119	844,351
Iron and steel rails	415	15,939	200	5,181
Cotton ties	105	3,686		
Hoop, band, and scroll iron or steel	28	2,873	3	224
Steel ingots, billets, blooms, slabs, etc	17,233	1,523,410	10,656	1,008,360
Sheet, plate, and taggers iron or steel	2,614	170,385	2,270	181,021
Tin plates	83,851	4,366,828	67,222	3,311,658
Wire rods, of iron or steel ..	16,459	772,950	15,762	767,909
Wire and wire rope, of iron or steel	2,554	344,855	2,017	318,553
Anvils	317	43,450	309	43,166
Chains	233	37,047	117	15,967
Cutlery		1,855,375		1,059,536
Files, file blanks, rasps, and floats		39,908		40,492
Firearms		632,104		611,862
Machinery		1,370,935		1,932,884
Needles		337,375		409,427
All other		1,207,673		1,185,887
Total	157,834	13,836,204	144,595	12,473,637

Of the pig iron imported in 1897 and 1898 and immediately preceding years much the larger part was spiegeleisen and ferromanganese, which pay duty as pig iron. Of these there were entered for consumption 101,167 gross tons in 1890, 41,449 tons in 1891, 47,310 tons in 1892, 37,199 tons in 1893, 9,722 tons in 1894, 39,582 tons in 1895, 39,311 tons in 1896, 17,163 tons in 1897, and 17,203 tons in 1898. There were also entered for consumption 158 tons of ferrosilicon in 1892, 154 tons in 1893, 228½ tons in 1894, 1,544 tons in 1895, 941 tons in 1896, 1,254 tons in 1897, and 1,038 tons in 1898.

EXPORTS OF IRON AND STEEL.

We are indebted to the Bureau of Statistics of the Treasury Department for the quantities and values of our exports of iron and steel in the calendar years 1897 and 1898, as follows. These statistics are given with more than usual fullness.

Exports of iron and steel in 1897 and in 1898.

Article.	1897.		1898.	
	Quantity.	Value.	Quantity.	Value.
Pig iron: ferromang. long tons..	5, 185	\$209, 295	3, 700	\$155, 299
Pig iron: all other .....do....	257, 501	3, 059, 715	249, 357	2, 547, 252
Scrap and old.....do....	42, 469	468, 185	73, 845	771, 590
Bar iron.....do....	4, 493	150, 897	7, 074	241, 499
Steel bars or rods, other than wire rods.....long tons..	39, 167	1, 066, 083	24, 195	676, 113
Steel-wire rods.....do....	a10, 484	240, 737	18, 510	390, 144
Iron rails.....do....	5, 413	95, 520	10, 865	152, 189
Steel rails.....do....	142, 808	2, 949, 901	291, 038	5, 787, 384
Billets, ingots, and blooms. do....	a6, 356	108, 333	28, 600	544, 771
Hoop, band, and scroll....do....	1, 424	44, 754	1, 593	58, 731
Iron sheets and plates....do....	4, 045	175, 799	4, 462	204, 170
Steel sheets and plates....do....	5, 074	173, 567	27, 075	787, 245
Tin plates and terneplates. do....	b2	176	46	5, 510
Structural iron and steel. do....	a15, 072	604, 339	34, 038	1, 255, 451
Wire.....do....	53, 075	2, 353, 829	74, 665	3, 036, 818
Cut nails and spikes.....do....	15, 077	670, 709	15, 735	641, 779
Wire nails and spikes.....do....	5, 793	255, 543	13, 714	574, 909
All other, including tacks. do....	3, 167	295, 111	2, 094	264, 390
Car wheels.....number..	21, 973	136, 852	20, 821	124, 069
Castings, not elsewhere speci- fied.....do....		862, 208		780, 830
Cutlery.....do....		164, 250		172, 982

a Not separately stated prior to July 1, 1897. b Not separately stated prior to December, 1897.

Exports of iron and steel in 1897 and in 1898—Continued.

Article.	1897.		1898.	
	Quantity.	Value.	Quantity.	Value.
Firearms		\$661,366		\$641,005
Locks, hinges, and other hardware		4,027,757		4,308,799
Saws		89,312		232,095
Tools, not elsewhere specified		2,288,013		2,404,327
Electrical machinery		a 917,453		2,523,644
Metal-working machinery		a 2,040,888		5,741,750
Printing presses, and parts of		743,221		843,688
Pumps and pumping machinery		a 955,334		2,300,811
Sewing machines		3,193,136		3,062,471
Shoemaking machinery		a 405,252		939,671
Fire engines .....number..	3	1,169	7	6,588
Locomotive engines .....do....	348	3,055,842	580	5,190,782
Stationary engines .....do....	546	359,698	523	352,668
Parts of engines and boilers		695,267		1,145,508
Typewriting machines, and parts of		1,566,916		2,077,250
All other machinery		16,237,045		16,413,893
Pipes and fittings		a 1,252,252		4,595,451
Safes .....number..	706	*46,469	1,542	106,085
Scales and balances		368,831		328,940
Stoves, ranges, and parts of		360,847		449,007
All other manufactures		9,385,379		9,933,992
Total		62,737,250		82,771,550
Agricultural implements, additional		5,302,807		9,073,384

a Not separately stated prior to July 1, 1897.

Our exports of iron and steel first exceeded our imports in value in the calendar year 1893. In 1898, five years later, the exports of iron and steel exceeded the imports by \$70,297,913.

EXPORTS OF AGRICULTURAL IMPLEMENTS.

The exports of agricultural implements in 1898 amounted to \$9,073,384, against \$5,302,807 in 1897, an increase of \$3,770,577. Mowers formed more than two-thirds of the total value of the agricultural implements exported in 1898, the exports of mowers alone amounting to \$6,551,741. During the same year the value of the plows exported amounted to \$1,126,070, and other agricultural implements to \$1,395,573.

PRODUCTION OF PIG IRON.

Nineteen States made pig iron in 1898, the same number as in 1897, and the same States. North Carolina, Minnesota, and Oregon did not make pig iron in 1897 or 1898.

The total production of pig iron in 1898 was 11,773,934 long tons, the largest in our history, against 9,652,680 tons in 1897, an increase of 2,121,254 tons, or very nearly 22 per cent. Large as was the increase in tonnage in 1898 as compared with the production in 1897 it was not so large as the increased production in 1895 over the production of 1894. In 1894 we made 6,657,388 tons, and in 1895 we made 9,446,308 tons, an increase of 2,788,920 tons, or nearly 42 per cent. There have been other years in our history, notably 1880 and 1886, in which the percentage of increased production exceeded that of 1898.

The production of pig iron in the second half of 1898 exceeded that of the first half by only 34,528 tons. The following table gives the total production of pig iron, by half years, since 1890:

Production of pig iron in the United States since 1890 by half years.

Year.	First half.	Second half.	Total.
	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>
1890.....	4,560,513	4,642,190	9,202,703
1891.....	3,368,107	4,911,763	8,279,870
1892.....	4,769,683	4,387,317	9,157,000
1893.....	4,562,918	2,561,584	7,124,502
1894.....	2,717,983	3,939,405	6,657,388
1895.....	4,087,558	5,358,750	9,446,308
1896.....	4,976,236	3,646,891	8,623,127
1897.....	4,403,476	5,249,204	9,652,680
1898.....	5,869,703	5,904,231	11,773,934

The following table gives the production of pig iron, by States, in 1897 and 1898, in the order of their prominence in 1898:

Production of pig iron by States in 1897 and 1898.

State.	1897.	1898.	State.	1897.	1898.
	<i>Long tons.</i>	<i>Long tons.</i>		<i>Long tons.</i>	<i>Long tons.</i>
Pennsylvania ..	4,631,634	5,537,832	Kentucky	35,899	100,724
Ohio	1,372,889	1,986,358	New Jersey ...	95,696	100,681
Illinois	1,117,239	1,365,898	Colorado	6,582	91,222
Alabama	947,831	1,033,676	Missouri	23,883	49,788
Virginia	307,610	283,274	Georgia	17,092	13,762
Tennessee	272,130	263,439	Connecticut...	8,336	6,336
New York	243,304	228,011	Texas	6,175	5,178
West Virginia..	132,907	192,699	Massachusetts	3,284	3,661
Maryland	193,702	190,974			
Wisconsin	103,909	172,781	Total	9,652,680	11,773,934
Michigan	132,578	147,640			

Twelve States increased their production of pig iron in 1898, the most notable increases being in Pennsylvania, Ohio, and Illinois. The increase in Kentucky, from 35,889 tons in 1897 to 100,724 tons in 1898, is also notable. Seven States—Connecticut, New York, Maryland, Virginia, Tennessee, Georgia, and Texas—made less pig iron in 1898 than in 1897, although the shrinkage in each State was more nominal than real. Pennsylvania made over 47 per cent of the total production of pig iron in 1898; Ohio over 16 per cent; Illinois over 11 per cent; Alabama almost 9 per cent; all the other States fell below 3 per cent.

The total production of 11,773,934 tons of pig iron in 1898 was divided as follows: Bessemer pig iron, 7,337,384 tons; charcoal pig iron, excluding charcoal Bessemer, included above, 292,681 tons; basic pig iron, 785,444 tons; spiegeleisen and ferro-manganese, 213,769 tons; foundry and forge pig iron, 3,144,656 tons.

TOTAL PRODUCTION OF PIG IRON FROM 1894 TO 1898.

The production of all kinds of pig iron from 1894 to 1898 was as follows, by States, in long tons:

Total production of pig iron, by States, since 1894.

State.	1894.	1895.	1896.	1897.	1898.
	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>
Massachusetts	156	4,710	1,873	3,284	3,661
Connecticut	7,416	5,615	10,187	8,336	6,336
New York	175,185	181,702	206,075	243,304	228,011
New Jersey	63,273	55,502	59,163	95,696	100,681
Pennsylvania	3,370,152	4,701,163	4,024,166	4,631,634	5,537,832
Maryland	5,600	10,916	79,472	193,702	190,974
Virginia	298,086	346,589	386,277	307,610	283,274
North Carolina		323	2,151		
Georgia	40,268	31,034	15,593	17,092	13,762
Alabama	592,392	854,667	922,170	947,831	1,033,676
Texas	4,671	4,682	1,221	6,175	5,178
West Virginia	80,781	141,968	108,569	132,907	192,699
Kentucky	33,854	63,780	70,660	35,899	100,724
Tennessee	212,773	248,129	248,338	272,130	263,439
Ohio	900,029	1,463,789	1,196,326	1,372,889	1,986,358
Illinois	604,795	1,006,091	925,239	1,117,239	1,365,898
Michigan	95,171	91,222	149,511	132,578	147,640
Wisconsin	91,595	148,400	158,484	103,909	172,781
Missouri	6,522	27,518	12,548	23,883	141,010
Colorado	73,669	58,508	45,104	6,582	
Oregon	1,000				
Total	6,657,388	9,446,308	8,623,127	9,652,680	11,773,934

PRODUCTION OF PIG IRON ACCORDING TO FUEL USED.

The production of pig iron in 1898, classified according to the fuel used, was as follows, compared with the four preceding years:

Production of pig iron according to fuel used, 1894 to 1898.

Fuel used.	1894.	1895.	1896.	1897.	1898.
	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>
Bituminous, chiefly coke	5,520,224	7,950,068	7,166,471	8,464,692	10,273,911
Anthracite and coke.	794,667	1,214,297	1,034,745	911,628	1,180,999
Anthracite alone ...	120,075	56,602	111,667	21,149	22,274
Charcoal	222,422	225,341	310,244	255,211	296,750
Total	6,657,388	9,446,308	8,623,127	9,652,680	11,773,934

The manufacture of pig iron in this country with unmixed anthracite coal is a rapidly decaying industry. As will be seen from the above table, we made only 21,149 tons of pig iron with anthracite alone in 1897 and only 22,274 tons in 1898. In both 1897 and 1898 New York did not make any pig iron with anthracite coal, either mixed or unmixed, whereas in former years anthracite was the principal fuel used in that State in the manufacture of pig iron.

CONSUMPTION OF PIG IRON.

Our consumption of pig iron in the last five years is approximately shown in the following table, in long tons, the comparatively small quantity of foreign pig iron held in bonded warehouses not being considered. Warrant stocks are included.

Consumption of pig iron since 1894.

Pig iron.	1894.	1895.	1896.	1897.	1898.
	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>
Domestic production ..	6,657,388	9,446,308	8,623,127	9,652,680	11,773,934
Imported	15,582	53,232	56,272	19,212	25,137
Stocks on hand January 1	707,318	661,328	506,132	847,686	874,978
Total supply	7,380,288	10,160,868	9,185,531	10,519,578	12,674,049
Deduct stocks December 31	661,328	506,132	847,686	874,978	415,333
Also exports	24,482	26,164	62,071	262,686	253,057
Approximate consumption	6,694,478	9,628,572	8,275,774	9,381,914	12,006,659

It appears from this table that our consumption of pig iron in 1898 averaged a little over a million tons per month.

LIMESTONE CONSUMED IN MAKING PIG IRON.

The limestone consumed for fluxing purposes by the blast furnaces in the United States in 1897, in the production of 9,652,680 gross tons of pig iron, amounted to 4,247,688 gross tons, of which 3,680,666 tons were consumed by the bituminous coal and coke furnaces in the production of 8,464,692 tons of pig iron, 524,271 tons by the anthracite and mixed anthracite and coke furnaces in the production of 932,777 tons, and 42,751 tons by the charcoal furnaces in the production of 255,211 tons. The average consumption of limestone for the whole country per ton of pig iron produced in 1897 was a little over 44 hundredths of a ton.

The total quantity of limestone similarly consumed in 1898 in the production of 11,773,934 tons of pig iron was 5,275,819 tons, of which 725,729 tons were consumed in producing 1,203,273 tons of pig iron made with anthracite and mixed anthracite coal and coke, 4,502,209 tons were consumed in producing 10,273,911 tons of pig iron made with bituminous coal and coke, and 47,881 tons were consumed in producing 296,750 tons of pig iron made with charcoal. The average consumption of limestone for the whole country per ton of pig iron made in 1898 was almost the same as in 1897, the figures being 448 thousandths of a ton, or about 8 thousandths of a ton more than in 1897.

The average consumption of limestone to the ton of pig iron in the United States in 1897 and 1898 was a little less than half a ton.

PRODUCTION OF BESSEMER STEEL.

The production of Bessemer steel ingots in the United States in 1898 was 6,609,017 tons, against 5,475,315 tons in 1897, 3,919,906 tons in 1896, 4,909,128 tons in 1895, 3,571,313 tons in 1894, and 3,215,686 tons in 1893. The production in 1898 was more than double that of 1893. There was an increase of 1,133,702 tons, or over 20 per cent, in 1898 as compared with 1897. The following table shows the production, by States, of Bessemer steel ingots in the last five years, including the production by the Clapp-Griffiths and the Robert-Bessemer works. Direct castings are counted as ingots. They amounted in 1898 to 3,539 tons. There were no Clapp-Griffiths works in operation in 1898, and only one Robert-Bessemer plant was active in that year. It was engaged exclusively in the production of steel castings.

Production of Bessemer steel ingots, 1894 to 1898.

State.	1894.	1895.	1896.	1897.	1898.
	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>
Pennsylvania	2,334,548	2,978,924	2,292,814	3,060,049	3,402,254
Ohio	363,974	719,954	568,535	1,041,541	1,489,115
Illinois.....	581,540	866,531	780,105	943,774	1,105,040
Other States	291,251	343,719	278,452	429,951	612,608
Total	3,571,313	4,909,128	3,919,906	5,475,315	6,609,017

The three leading Bessemer steel producing States are Pennsylvania, Ohio, and Illinois. In 1898 Pennsylvania made over 51 per cent of all the Bessemer steel produced, against over 55 per cent in 1897; Ohio made over 22 per cent in 1898, against over 19 per cent in 1897; and Illinois made over 16 per cent in 1898, against over 17 per cent in 1897. No other State made over 4 per cent in 1898.

Sixteen standard Bessemer steel plants, nearly all small works, did not make steel in 1898, and a like number were idle in 1897. No new standard Bessemer steel works were erected in 1898.

Bessemer steel, including the production of the single Robert-Bessemer plant mentioned above, was made in eight States in 1898, the same number as in 1897, namely, Pennsylvania, Maryland, West Virginia, Kentucky, Ohio, Illinois, Michigan, and Colorado. All the Bessemer steel produced in 1898 was made by the acid process.

PRODUCTION OF OPEN-HEARTH STEEL.

The total production of open-hearth steel in the United States in 1898 was 2,230,292 long tons, against 1,608,671 tons in 1897, an increase of 621,621 tons, or over 38 per cent.

The following table gives the production of open-hearth steel ingots and direct castings by States during the past six years:

Production of open-hearth steel, 1893 to 1898.

State.	1893.	1894.	1895.	1896.	1897.	1898.
	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>
New England ..	24, 759	26, 204	36, 733	48, 055	51, 402	47, 381
New York and						
New Jersey...	17, 591	21, 363	32, 203	32, 120	39, 521	47, 957
Pennsylvania ..	616, 516	659, 969	904, 352	1, 009, 608	1, 271, 751	1, 817, 521
Ohio	50, 385	54, 182	75, 637	64, 691	78, 357	79, 886
Illinois.....	28, 639	23, 218	49, 500	101, 832	120, 609	183, 103
Other States ...			38, 757	42, 394	47, 031	54, 444
Total	737, 890	784, 936	1, 137, 182	1, 298, 700	1, 608, 671	2, 230, 292

The open-hearth steel made in 1898 was produced by 63 works in 13 States—Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Kentucky, Alabama, Ohio, Indiana, Illinois, Wisconsin, Missouri, and California.

Our statistics of the production of open-hearth steel separate steel made in the open hearth by the acid and basic processes only for the years 1896, 1897, and 1898.

Of the total production in 1898, 1,569,412 tons were made by the basic process and 660,880 tons by the acid process. In 1897 the production by the basic process amounted to 1,056,043 tons and by the

acid process to 552,628 tons. In 1896 the production by the basic process amounted to 776,256 tons and by the acid process to 522,444 tons. Twelve works made basic open-hearth steel only in 1898, 35 made acid open-hearth steel only, and 16 made both acid and basic open-hearth steel. The following table gives the production by States in 1898:

Production of basic and acid open-hearth steel in 1898.

State.	Basic open-hearth steel.	Acid open-hearth steel.	Total.
	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>
New England	9,486	37,915	47,381
New York and New Jersey	13,024	34,933	47,957
Pennsylvania	1,321,308	496,213	1,817,521
Ohio	43,650	36,236	79,886
Illinois	153,891	29,212	183,103
Other States	28,073	26,371	54,444
Total	1,589,412	660,880	2,250,292

For the first time we have separated the production in 1898 of open-hearth direct steel castings from the ingots. The total production of open-hearth steel castings in 1898 amounted to 120,587 gross tons, of which 28,460 tons were made by the basic process and 92,127 tons were made by the acid process. The open-hearth steel rails produced in 1898 amounted to 1,220 tons, against 500 tons in 1897 and 705 tons in 1896.

PRODUCTION OF CRUCIBLE STEEL.

The production of crucible steel in the United States in 1898 amounted to 89,747 long tons, against 69,959 tons in 1897, 60,689 tons in 1896, 67,666 tons in 1895, 51,702 tons in 1894, 63,613 tons in 1893, 84,709 tons in 1892, 72,586 tons in 1891, and 71,175 tons in 1890. The crucible steel produced in 1898 was made in ten States—Connecticut, New York, New Jersey, Pennsylvania, Maryland, Tennessee, Ohio, Indiana, Illinois, and Wisconsin. The direct castings produced in 1898 amounted to 4,235 tons.

Of the total production in 1898 of 89,747 long tons of crucible steel, Connecticut and New York contributed 8,365 tons; New Jersey, 9,629 tons; Pennsylvania, 69,244 tons; the Western States, 1,704 tons; and the Southern States, 805 tons.

PRODUCTION OF MISCELLANEOUS STEEL.

The production of steel in the United States in 1898 by various minor processes amounted to 3,801 long tons, of which 3,576 tons were direct castings, against 3,012 tons in 1897, 2,394 tons in 1896, 858 tons in 1895, 4,081 tons in 1894, 2,806 tons in 1893, 4,548 tons in 1892, 4,484 tons in 1891, and 3,793 tons in 1890.

TOTAL PRODUCTION OF ALL KINDS OF STEEL.

The production of all kinds of steel in the United States in 1898 was as follows: Bessemer steel, 6,609,017 long tons; open-hearth steel, 2,230,292 tons; crucible steel, 89,747 tons; all other steel, 3,801 tons: total, 8,932,857 tons, against 7,156,957 tons in 1897, 5,281,689 tons in 1896, 6,114,834 tons in 1895, 4,412,032 tons in 1894, 4,019,995 tons in 1893, and 4,927,581 tons in 1892. In the total for 1898 are included 131,937 tons of direct castings.

PRODUCTION OF IRON AND STEEL RAILS.

The total production of Bessemer steel rails in 1898 amounted to 1,976,702 long tons, against 1,644,520 tons in 1897. Of the production of 1898, Pennsylvania made 1,053,326 tons, as compared with 1,027,996 tons in 1897; Illinois and the remainder of the country made 923,376 tons, against 616,524 tons in 1897.

The production of all kinds of rails in the United States in 1898, including light and heavy rails, and street, electric, and mine rails, was 1,981,241 long tons, against 1,647,892 tons in 1897, an increase of 333,349 tons, or over 20 per cent. The production of 1898 was composed of 1,955,427 tons of Bessemer steel rails rolled by the producers of domestic ingots, 21,275 tons of Bessemer steel rails rerolled from old steel rails and rolled from purchased blooms, 1,220 tons of open-hearth steel rails, and 3,319 tons of iron rails.

Twelve States made rails in 1898, namely, Pennsylvania, Maryland, Alabama, Tennessee, Ohio, Indiana, Illinois, Wisconsin, Kansas, Colorado, Wyoming, and California. All made Bessemer-steel rails except Tennessee, Alabama, Indiana, and Wyoming. The production of Bessemer-steel rails outside of Pennsylvania, Illinois, Ohio, Maryland, Colorado, and Wisconsin was very small. The iron rails were made in Pennsylvania, Tennessee, Alabama, Ohio, Indiana, Illinois, and Wyoming. The open-hearth steel rails were produced in Pennsylvania, Alabama, and California.

Of the total production of rails in 1898 Pennsylvania made over 53 per cent, against over 62 per cent in 1897. Illinois made over 27 per cent, against over 26 per cent in 1897. These two States made almost 81 per cent of all the rails rolled in 1898, against almost 89 per cent in 1897.

The total production of 1,981,241 tons of rails in 1898 was divided as follows: Weighing under 45 pounds to the yard, 123,881 tons; weighing 45 pounds and less than 85 pounds, 1,404,150 tons; weighing 85 pounds and over, 453,210 tons.

The rails reported to us which are known to have been rolled for street and electric railways in 1898 amounted to 143,815 tons, against 122,244 tons in 1897, an increase of 21,571 tons. With the exception of a few hundred tons, all were steel rails. The following table gives the production of street rails in this country from 1891 to 1898:

Production of steel rails for street and electric railways from 1891 to 1898.

Year.	Long tons.	Year.	Long tons.	Year.	Long tons.	Year.	Long tons.
1891....	81,302	1893....	133,423	1895....	163,109	1897....	122,244
1892....	111,580	1894....	157,457	1896....	145,210	1898....	143,815

The following table gives the production of all kinds of rails in the United States from 1891 to 1898:

Production of rails of all kinds, 1891 to 1898.

Year.	Iron.	Steel.	Total.	Year.	Iron.	Steel.	Total.
	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>		<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>
1891..	8,240	1,296,936	1,307,176	1895...	5,810	1,300,325	1,306,135
1892..	10,437	1,541,407	1,551,844	1896...	4,347	1,117,663	1,122,010
1893..	6,090	1,130,368	1,136,458	1897...	2,872	1,645,020	1,647,892
1894..	4,674	1,017,098	1,021,772	1898...	3,319	1,977,922	1,981,241

With the single exception of 1887, when 2,139,640 long tons of rails were made, more rails were produced in 1898 than in any other year in our history. The year of next largest production was 1890, the production in that year being 1,885,307 tons. The year of next largest production was 1897.

PRODUCTION OF IRON AND STEEL STRUCTURAL SHAPES.

Our statistics of iron and steel structural shapes embrace the production of beams, beam girders, zee bars, tees, channels, angles, and other structural forms, but they do not include plate girders made from plates. Plates are provided for under other classifications, and under the general statistics of plates are included all plates cut to specifications. Nearly all the structural shapes and plates used for structural purposes are made of steel. The total production in 1897 and 1898 by States was as follows.

Production of iron and steel structural shapes in 1897 and 1898.

State.	1897.	1898.	State.	1897.	1898.
	<i>Long tons.</i>	<i>Long tons.</i>		<i>Long tons.</i>	<i>Long tons.</i>
New England, New York, and New Jersey.....	20,785	27,919	Ohio	13,629	21,233
Pennsylvania.....	538,055	641,726	Colorado and Cali- fornia	8,937	7,731
Kentucky and Alabama.....	2,384	3,588	Total	583,790	702,197

The increased production of structural shapes in 1898, as compared with 1897, was 118,407 long tons, or over 20 per cent. Pennsylvania made over 91 per cent of the total production in 1898, New Jersey almost 4 per cent, and Ohio over 3 per cent. No other State made over 1.5 per cent. The total production of structural shapes in 1897 was 583,790 tons, in 1896 it was 495,571 tons, and in 1895 it was 517,920 tons.

PRODUCTION OF PLATES AND SHEETS.

The production of plate and sheet iron and steel in the United States in 1898, excluding nail plate, amounted to 1,448,301 long tons, against 1,207,286 tons in 1897, 965,776 tons in 1896, 991,459 tons in 1895, 682,900 tons in 1894, 674,345 tons in 1893, and 751,460 tons in 1892. Skelp iron and steel are not included in our tables with plates and sheets but with other rolled products.

The following table gives the production of iron and steel plates and sheets, by gauges, not including nail plate, in 1898, in long tons:

Production of iron and steel plates and sheets in 1898.

State.	Up to No. 8, inclusive.	No. 9 to No. 17, inclusive.	No. 18 and thinner.	Total.
	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>
New England.....		243		243
New York and New Jersey.....	2, 110		1, 000	3, 110
Pennsylvania.....	522, 851	79, 841	315, 718	918, 410
Delaware and Maryland.....	1, 600	552	19, 111	21, 263
West Virginia.....	67	2, 650	30, 247	32, 964
Kentucky and Alabama.....	8, 350	5, 713	14, 650	28, 713
Ohio.....	33, 397	21, 907	201, 129	256, 433
Indiana, Illinois, and Missouri...	70, 486	6, 599	110, 080	187, 165
Total	638, 861	117, 505	691, 935	1, 448, 301

The production of "black plates for tinning" alone in 1898 is reported to us to have amounted to 345,254 long tons, against 271,886 tons in 1897, an increase of 73,368 tons, or almost 27 per cent. Of the production in 1898 Pennsylvania made 149,562 tons; Indiana, 80,028 tons; Ohio, 77,788 tons; and Maryland, West Virginia, Kentucky, Illinois, and Missouri, 37,876 tons. The production of "black plates for tinning" in 1896 was 185,387 tons, against 129,615 tons in 1895 and 52,359 tons in 1894.

PRODUCTION OF WIRE RODS.

The production of iron and steel wire rods in the United States in 1898 amounted to 1,071,683 long tons, against 970,736 tons in 1897 and 623,986 tons in 1896, showing an increase of 100,947 tons, or over 10 per

cent over 1897 and 447,697 tons over 1896. Pennsylvania made the largest quantity in 1898, with Ohio second in production, Illinois third, and Massachusetts fourth. Three other States, Connecticut, New Jersey, and Indiana, also rolled rods in 1898. The following table gives our production of wire rods by States during the past six years:

Production of wire rods by States, 1893 to 1898.

State.	1893.	1894.	1895.	1896.	1897.	1898.
	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>
New England and New York	79,618	88,913	91,513	63,808	94,471	107,311
New Jersey	23,013	20,880	22,290	15,925		
Pennsylvania	227,257	246,101	278,406	233,352	351,676	417,636
Ohio	140,047	173,272	210,058	146,329	265,317	269,566
Indiana and Illinois	67,337	114,236	188,863	164,572	259,272	277,170
Total	537,272	673,402	791,130	623,986	970,736	1,071,683
Iron	1,125	5,772	2,840	2,473	2,019	2,106
Steel	536,147	667,630	788,290	621,513	968,717	1,069,577

PRODUCTION OF WIRE NAILS.

The production of iron and steel wire nails in the United States in 1898 amounted to 7,418,475 kegs of 100 pounds each, compared with 8,997,245 kegs in 1897, a decrease of 1,578,770 kegs, or over 17 per cent. In 1896 the production amounted to 4,719,860 kegs, in 1895 to 5,841,403 kegs, in 1894 to 5,681,801 kegs, and in 1893 to 5,095,945 kegs. The wire nails produced in 1898 were manufactured by 59 works, 5 less than were in operation in 1897. The following table gives the production of wire nails by States in 1897 and 1898, in kegs of 100 pounds:

Production of wire nails by States in 1897 and 1898.

State.	1897.	1898.
	<i>Kegs.</i>	<i>Kegs.</i>
Massachusetts, Rhode Island, and Connecticut	160,662	126,253
New York and New Jersey	248,132	109,833
Pennsylvania	3,467,509	3,408,504
Maryland and West Virginia	15,100	5,000
Ohio	2,237,641	1,711,399
Indiana and Wisconsin	733,669	494,378
Illinois	1,993,547	1,394,981
Missouri, Kansas, Michigan, Washington, and California	140,985	168,127
Total	8,997,245	7,418,475

PRODUCTION OF CUT NAILS.

Our statistics of the production of iron and steel cut nails and cut spikes in the United States do not embrace railroad and other spikes made from bar iron, wire nails of any size, or machine-made horseshoe nails. Cut spikes are included with cut nails.

The total production of cut nails in 1898 was 1,572,221 kegs of 100 pounds each, against 2,106,799 kegs in 1897, a decrease of 534,578 kegs, or over 25 per cent. In 1886 the maximum production of 8,160,973 kegs was reached. In 1898 the production of wire nails exceeded the production of cut nails by 5,846,254 kegs. In 1897 the wire-nail production exceeded the cut-nail production by 6,890,446 kegs.

Nine States made cut nails in 1898. The following table shows the production of iron and steel cut nails by States from 1893 to 1898, in kegs of 100 pounds. The wire-nail production for the same years is added to the table:

Production of cut nails since 1893.

State.	1893.	1894.	1895.	1896.	1897.	1898.
	<i>Kegs.</i>	<i>Kegs.</i>	<i>Kegs.</i>	<i>Kegs.</i>	<i>Kegs.</i>	<i>Kegs.</i>
Pennsylvania ..	1, 113, 168	1, 061, 931	938, 865	646, 011	1, 057, 964	768, 171
Ohio	768, 031	490, 461	347, 162	264, 272	411, 396	392, 003
West Virginia..	330, 859	273, 822	347, 022	286, 210	290, 203	184, 942
Indiana	177, 648	125, 000				
Massachusetts and New Jer- sey	337, 039	166, 350	161, 888	137, 005	142, 021	127, 706
Illinois.....	81, 128	94, 462	81, 773	91, 145	34, 000	87, 399
Maryland, Vir- ginia, and Kentucky	224, 060	213, 034	246, 184	167, 227	164, 465	
Missouri, Colo- rado, Wyo- ming, and California....	17, 000	.....	7, 000	24, 000	6, 750	12, 000
Total cut nails ...	3, 048, 933	2, 425, 060	2, 129, 894	1, 615, 870	2, 106, 799	1, 572, 221
Total wire nails ...	5, 095, 945	5, 681, 801	5, 841, 403	4, 719, 860	8, 997, 245	7, 418, 475
Grand to- tal	8, 144, 878	8, 106, 861	7, 971, 297	6, 335, 730	11, 104, 044	8, 990, 696

TOTAL PRODUCTION OF ALL ROLLED IRON AND STEEL.

By the phrase rolled iron and steel we include all iron and steel rolled into finished forms, as follows: (1) All sizes of iron and steel rails; (2) plate and sheet iron and steel; (3) iron and steel plates for

cut nails and cut spikes; (4) wire rods; (5) iron and steel structural shapes; (6) bar, bolt, hoop, skelp, and rolled axles. Hammered axles and other forgings are not included, nor muck bars, billets, and tin-plate and sheet bars.

The production of all iron and steel rolled into finished forms in the United States in 1898 was 8,513,370 long tons, against 7,001,728 tons in 1897, an increase of 1,511,642 tons, or over 21 per cent. Twenty-seven States rolled either iron or steel or both iron and steel in 1898, one more than in 1897. The following table gives the total production by States of iron and steel rolled into all kinds of finished forms in 1897 and 1898, in long tons.

Total production of all kinds of rolled iron and steel in 1897 and 1898.

State.	1897.	1898.	State.	1897.	1898.
	<i>Long tons.</i>	<i>Long tons.</i>		<i>Long tons.</i>	<i>Long tons.</i>
Maine.....			Ohio.....	1,017,124	1,231,739
New Hampshire.....	2,519	3,751	Indiana.....	254,376	352,058
Massachusetts.....	94,319	104,221	Illinois.....	863,013	1,071,327
Rhode Island.....			Michigan.....		
Connecticut.....	30,233	42,158	Wisconsin.....	136,016	192,281
New York.....	81,283	83,735	Minnesota.....		
New Jersey.....	86,421	96,281	Missouri.....	35,505	32,526
Pennsylvania.....	3,956,727	4,622,770	Kansas.....		9,940
Delaware.....	43,962	45,973	Colorado.....	22,710	99,050
Maryland.....	82,926	149,820	Wyoming.....		
Virginia.....	26,482	34,497	Washington.....		
West Virginia.....	151,424	198,833	Oregon.....	37,997	30,653
Kentucky.....	30,968	39,239	California.....		
Tennessee.....					
Georgia.....	9,840	10,621	Total.....	7,001,728	8,513,370
Alabama.....	37,763	59,897			

Pennsylvania made 54.3 per cent of the total production of rolled iron and steel in 1898, against 56.5 per cent in 1897; Ohio made 14.4 per cent in 1898, against 14.5 per cent in 1897; Illinois made 12.5 per cent in 1898, against 12.3 per cent in 1897; and Indiana made 4.1 per cent in 1898, against 3.6 per cent in 1897. No other State produced 3 per cent in 1898. New Hampshire, Georgia, Texas, and Iowa, all of which have rolling mills located within their borders, did not roll iron or steel in 1898.

It has been impossible in late years to separate rolled iron from rolled steel, but the fact is worthy of mention that the use of puddled iron in this country is now increasing.

**PRODUCTION OF ROLLED IRON AND STEEL IN THE
UNITED STATES FROM 1887 TO 1898.**

The total production of rolled iron and steel in the United States during the twelve years from 1887 to 1898 is given below. As the production of wire rods was not ascertained separately for 1887, it is included for that year with bars, hoops, skelp, and shapes:

Total production of rolled iron and steel from 1887 to 1898.

Year.	Iron and steel rails.	Bars, hoops, skelp, and shapes.	Wire rods.	Plates and sheets, except nail plate.	Cut nails.	Total.
	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>
1887.....	2, 139, 640	2, 184, 279	.....	603, 355	308, 432	5, 235, 706
1888.....	1, 403, 700	2, 034, 162	279, 769	609, 827	289, 891	4, 617, 349
1889.....	1, 522, 204	2, 374, 968	363, 851	716, 496	259, 409	5, 236, 928
1890.....	1, 885, 307	2, 618, 660	457, 099	809, 981	251, 828	6, 022, 875
1891.....	1, 307, 176	2, 644, 941	536, 607	678, 927	223, 312	5, 390, 963
1892.....	1, 551, 844	3, 033, 439	627, 829	751, 460	201, 242	6, 165, 814
1893.....	1, 136, 458	2, 491, 497	537, 272	674, 345	136, 113	4, 975, 685
1894.....	1, 021, 772	2, 155, 875	673, 402	682, 900	108, 262	4, 642, 211
1895.....	1, 306, 135	3, 005, 765	791, 130	991, 459	95, 085	6, 189, 574
1896.....	1, 122, 010	2, 731, 932	623, 986	965, 776	72, 137	5, 515, 841
1897.....	1, 647, 892	3, 081, 760	970, 736	1, 207, 286	94, 054	7, 001, 728
1898.....	1, 981, 241	3, 941, 957	1, 071, 683	1, 448, 301	70, 188	8, 513, 370

PRODUCTION OF ALLEGHENY COUNTY, PENNSYLVANIA.

The following table gives the number of blast furnaces, rolling mills, and steel works, and the production in long tons of pig iron and crude steel and of iron and steel rolled into finished forms in Allegheny County, Pennsylvania, in 1896, 1897, and 1898.

Iron and steel statistics of Allegheny County, Pennsylvania, for three years, 1896, 1897, and 1898.

Details.	1896.	1897.	1898.
	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>
Blast furnaces.....	a 28	a 30	a 30
Production of pig iron.....	2, 061, 269	2, 663, 093	3, 022, 901
Rolling mills and steel works.....	a 64	a 61	a 60
Production of Bessemer steel.....	1, 608, 321	2, 061, 837	2, 338, 087
Production of open-hearth steel.....	569, 680	725, 262	1, 042, 350
Production of crucible and other steel.....	33, 596	42, 231	52, 352
Total production of steel.....	2, 211, 597	2, 829, 330	3, 432, 789
Production of rails, bars, bolts, rods, shapes, hoops, skelp, etc.....	1, 350, 886	1, 797, 064	2, 091, 503
Production of plates and sheets.....	324, 296	395, 830	444, 850
Total production of rolled iron and steel.....	1, 675, 182	2, 192, 894	2, 536, 353

a Number.

Allegheny County produced in 1898 over 25 per cent of the total production of pig iron in the United States; over 35 per cent of the total production of Bessemer steel ingots and castings; almost 47 per cent of the total production of open-hearth steel ingots and castings; over 58 per cent of the total production of crucible steel; over 28 per cent of the total production of Bessemer steel rails; over 64 per cent of the total production of structural shapes; over 30 per cent of the total production of plates and sheets, and almost 25 per cent of the production of miscellaneous rolled products not enumerated above. Of the total production of all kinds of rolled iron and steel, including rails, Allegheny County made in 1898 over 29 per cent.

IRON AND STEEL SHIP BUILDING.

In the fiscal year 1898 the United States built 63 iron and steel vessels, against 68 in the fiscal year 1897. The gross tonnage of the vessels built in the fiscal year 1898 was 62,266 tons, against 124,394 tons in the preceding year. Vessels for the United States Navy are not included in the figures here given, which have all been furnished by Hon. Eugene T. Chamberlain, Commissioner of Navigation of the Treasury Department. With the exception of two steel sailing vessels and ten steel barges, all the vessels built in the fiscal year 1898 were built to use steam. Only one composite vessel and two iron vessels were built. The fiscal year 1899 will show a much larger tonnage.

PRODUCTION OF IRON BLOOMS AND BILLETS.

The blooms and billets produced in forges directly from the ore in 1898 amounted to 1,767 long tons, against 1,455 tons in 1897, 1,346 tons in 1896, 40 tons in 1895, 40 tons in 1894, 864 tons in 1893, 2,182 tons in 1892, 5,290 tons in 1891, 7,094 tons in 1890, and 11,078 tons in 1889. The ore blooms produced in 1897 and 1898 were all made by the Chateaugay Ore and Iron Company, of Plattsburg, New York. The Helton Forge of W. J. Pasley, at Crumpler, Ashe County, North Carolina, the sole survivor of hundreds of Catalan forges in the South, was not running in 1897 or 1898.

The iron blooms produced in forges from pig and scrap iron in 1898, and which were for sale and not intended for the consumption of the makers, amounted to 6,345 long tons, against 7,159 tons in 1897, 6,494 tons in 1896, 7,185 tons in 1895, 3,221 tons in 1894, and 6,605 tons in 1893. All the pig and scrap blooms made in forges in 1895, 1896, 1897, and 1898, and for sale, were produced in Pennsylvania and Maryland.

PRODUCTION OF TIN PLATES.

The duty on tin plates and terne plates provided for in the tariff act of 1890 went into effect on July 1, 1891. From that date until the close of the fiscal year ending on June 30, 1897, the statistics of our production of tin plates and terne plates were regularly collected for the

Treasury Department by Col. Ira Ayer, special agent. For the second half of 1897 and the year 1898 they have been collected by the editor of the Metal Worker, of New York. From the data thus obtained we have compiled the following table in long tons of our production of tin plates and terne plates in the calendar years 1891 to 1898, the figures for 1891 being for the last six months only. The output of dipping plants is included in the figures for each year.

Production of tin plates in the United States from 1891 to 1898.

Calendar year.	Long tons.	Calendar year.	Long tons.
1891 (last six months) ..	999	1896.....	160,362
1892.....	18,803	1897.....	256,598
1893.....	55,182	1898.....	326,915
1894.....	74,260	Total	1,006,785
1895.....	113,666		

PHILADELPHIA, June 15, 1899.

THE FOREIGN IRON TRADE IN 1898 AND IMMEDIATELY PRECEDING YEARS.¹

By JAMES M. SWANK,

General Manager of the American Iron and Steel Association.

INTRODUCTION.

Briefly stated, the active demand for iron and steel which has characterized all the European markets since the second half of 1895 was continued in 1898, with rising prices. Nearly all European iron-producing countries show an increase in production in 1898 as compared with 1897, a conspicuous exception to this rule being Great Britain, in which country there was a decline in production in some leading branches, but not in all, open-hearth steel showing a considerable increase. But on the Continent there was a very general increase. The activity of 1898 has been continued thus far in 1899, and prices generally have been still further advanced.

A leading factor in reducing the British production of iron and steel in 1898 was the strike of the Welsh coal miners for higher wages, which occurred on April 1 and lasted until the last of August, a period of five months. The strike extended also to the adjoining English county of Monmouth. The production of pig iron and tin plates was directly affected by the strike, as was also, of course, the production of coal itself and the business of the railroads. The production of coal in Wales in 1898 was about 5,560,000 tons less than in 1897, and there was a falling off of about 3,250,000 tons in the production of Monmouth. In the end the men yielded to the masters' terms, which granted a slight advance upon the wages previously paid. Another reason for the decline in the production of iron and steel in Great Britain in 1898 was the active competition of the United States and continental countries in neutral markets and even in the British market itself. British exports of iron and steel sensibly declined in that year.

We present below detailed statistics of the production of iron and steel in foreign countries in 1898, so far as they have been received, statistics for 1897 and other recent years being also given.

[¹ The following pages embody the most recent compilation of foreign iron and steel statistics which I have made for the American Iron and Steel Association. In a few instances they repeat, for the sake of harmony and completeness, statistical statements which were contained in a paper that I had the honor to compile for the United States Geological Survey in 1898.]

GREAT BRITAIN.

Mr. J. S. Jeans, the secretary of the British Iron Trade Association, estimates the production of pig iron in Great Britain in 1898 at 8,631,151 long tons, against an ascertained production of 8,796,465 tons in 1897, these latter being the official Government figures. The largest annual production of pig iron by Great Britain, as officially ascertained, was in 1897. The next largest production was 8,659,681 tons in 1896, and the next largest production was 8,586,680 tons in 1882.

Mr. Jeans gives the production of Bessemer steel ingots in Great Britain in 1898 as 1,759,386 long tons, against 1,884,155 tons in 1897, and he gives the production of Bessemer steel rails in 1898 as 751,591 tons, against 921,131 tons in 1897. There were 62 Bessemer converters at work in 1898 and 18 were idle.

The production of open-hearth steel ingots in Great Britain in 1898, according to the same authority, was 2,806,600 long tons, against 2,601,806 tons in 1897. The production of open-hearth steel rails in 1898 amounted to 20,444 tons, against 31,694 tons in 1897. The total number of acid open-hearth furnaces is now 336, and 23 are building. The total number of basic open-hearth furnaces is 42, with none building.

The Bessemer steel ingots produced in 1898 were divided into 1,255,252 tons of acid and 504,134 tons of basic steel. The open-hearth steel ingots produced in 1898 were divided into 2,590,512 tons of acid and 216,088 tons of basic steel.

The production of puddled bars in Great Britain in 1898 was 1,115,699 long tons, against 1,288,159 tons in 1897, 1,214,005 tons in 1896, and 1,148,012 tons in 1895.

The maximum production of iron ore in Great Britain was attained in 1882, when 18,031,957 tons were mined. After that year there was a steady decline in production until 1893, when only 11,203,476 tons were mined. Since 1893 there has been a gradual increase in production, the figures for 1897 being 13,787,878 tons and for 1898 being 14,176,938 tons. As far back as 1870 the production was 14,370,655 tons.

Great Britain is a large importer of iron ore. In 1896 she imported 5,438,307 long tons; in 1897 she imported 5,968,680 tons; and in 1898 she imported 5,468,395 tons, the principal imports in each year coming from Spain. In addition to the above imports there were imported in 1896 "purple ore," or residuum of cupreous iron pyrites, amounting to 441,792 tons, and in 1897 amounting to 467,318 tons.

The total exports of iron and steel from Great Britain to all countries in 1898 amounted to 3,247,368 tons, against 3,686,106 tons in 1897 and 3,550,398 tons in 1896. The exports of pig iron in 1898 amounted to 1,042,296 tons, against 1,201,104 tons in 1897. The exports of steel rails in 1898 amounted to 476,786 tons, against 579,983 tons in 1897 and 581,249 tons in 1896. The exports of tin plates to the United States in 1898 amounted to 65,337 tons, against 85,472 tons in 1897.

The exports of tin plates to all countries declined from 271,230 tons in 1897 to 251,769 tons in 1898. As late as 1893 Great Britain's exports of tin plates to the United States alone exceeded her total exports of tin plates in 1898.

Great Britain obtains from foreign countries most of the tin that her manufacturers use in the production of tin plates. In 1897 she obtained from her own mines in Cornwall and Devonshire 4,452 tons and 14 hundredweights of metallic tin, and in the same year she imported 26,785 tons and 16 hundredweights. In 1896 she produced 4,837 tons and 14 hundredweights and imported 38,374 tons and 15 hundredweights. The imports come chiefly from the Straits Settlements, Australasia, and Chili. In 1896 there were also imported 4,872 tons of tin ore, and in 1897 there were 5,261 tons imported. Great Britain is a very large exporter of tin, most of which had previously been imported. Her total exports in 1897 amounted to 19,724 long tons, and in 1896 they amounted to 24,907 tons.

During the last few years the imports of iron and steel into Great Britain have largely increased. They amounted to 591,425 tons in 1898, against 362,827 tons in 1897 and 333,050 tons in 1896. In 1894 they amounted to only 292,908 tons. In 1898 Great Britain imported 103,439 tons of beams, girders, and pillars, against 75,910 tons in 1897 and 75,197 tons in 1896. In 1897 18,036 tons of steel rails were exported from Germany to England. The imports of pig iron and steel into Great Britain from the United States in 1897 and 1898 were as follows: pig iron, 1897, 91,196 tons; 1898, 76,356 tons; steel, 1897, 25,917 tons; 1898, 29,374 tons.

The production of coal in Great Britain in 1898 amounted to 202,054,516 tons, against a production in 1897 of 202,129,931 tons, 195,361,260 tons in 1896, 189,661,362 tons in 1895, 188,277,525 tons in 1894, and 164,325,795 tons in 1893.

The exports of coal from Great Britain to other countries in 1897 amounted to 35,354,296 gross tons, against 32,947,680 tons in 1896 and 31,714,906 tons in 1895. The exports of coke amounted to 978,327 tons in 1897, against 676,811 tons in 1896 and 700,064 tons in 1895. In addition to the coal exports given above 10,455,758 tons of coal were exported in 1897 for the use of British steamers engaged in the foreign trade, against 9,937,305 tons in 1896 and 9,407,789 tons in 1895.

GERMANY.

The iron and steel statistics of Germany embrace the production of Luxemburg. The production of pig iron in Germany and Luxemburg in 1898 was 7,232,988 metric tons, according to Dr. Rentzsch, the statistician of the Association of German Iron and Steel Manufacturers, against 6,881,466 tons in 1897 and 6,372,575 tons in 1896. Of the production in 1898 Germany made 6,366,901 tons and Luxemburg 866,087 tons. Of the pig iron now annually produced in Germany and Luxemburg about 50 per cent is Thomas, or basic, pig iron.

The total production of steel in Germany in 1898 was 5,779,570 metric tons, including 441,039 tons of ingots and 986,572 tons of blooms and billets for sale. This is an increase of 660,270 tons on the output of 1897, when the total quantity produced was 5,119,300 tons, including 361,637 tons of ingots and 910,560 tons of blooms and billets for sale.

The production of basic steel in Germany in 1898 amounted to 5,065,896 metric tons, of which 3,606,737 tons were made by the Bessemer process and 1,459,159 tons by the open-hearth process. Steel castings are not included in these figures. The production of steel rails in Germany in 1897 amounted to 792,610 metric tons, against 580,732 tons in 1896 and 493,855 tons in 1895.

The imports of pig iron and old iron into Germany in 1898 amounted to 407,889 metric tons, against 461,084 tons in 1897. The exports of pig iron and old iron from Germany in 1898 amounted to 272,470 tons, against 128,987 tons in 1897. The exports of rails and sleepers from Germany in 1898 amounted to 154,641 tons, against 144,661 tons in 1897; of bars to 263,698 tons, against 246,772 tons in 1897; and of plates and sheets to 157,638 tons, against 138,057 tons in 1897. The imports of these articles into Germany in the two years named amounted to between 30,000 and 40,000 tons annually.

The production of iron ore in Germany and Luxemburg in 1898 amounted to 15,893,246 metric tons, of which Germany produced 10,544,295 tons and Luxemburg 5,348,951 tons. In 1897 the total production amounted to 15,465,979 tons, of which Germany produced 10,116,969 tons and Luxemburg 5,349,010 tons.

The imports of iron ore in 1898 amounted to 3,516,577 metric tons, against 3,185,644 tons in 1897. In 1898 the exports of iron ore amounted to 2,933,734 tons, against 3,230,391 tons in 1897.

The total production of coal in Germany in 1898 amounted to 130,928,490 metric tons, of which 99,279,992 tons were bituminous coal and 31,648,498 tons were brown coal. In 1897 the total production was 120,474,485 tons, of which 91,054,982 tons were bituminous coal and 29,419,503 tons were brown coal.

The imports of coal into Germany in 1898 amounted to 14,270,481 metric tons, against 14,183,103 tons in 1897. Of the imports in 1898 there were 5,820,332 tons of bituminous coal and 8,450,149 tons of brown coal. The exports of coal from Germany in 1898 amounted to 14,011,376 tons, against 12,409,017 tons in 1897. Almost all the coal exported from Germany is bituminous, the figures for 1898 being as follows: Bituminous, 13,989,222 tons; brown coal, 22,154 tons: total, 14,011,376 tons.

Germany is a large exporter of coke, her exports amounting to 2,133,178 metric tons in 1898 and to 2,161,886 tons in 1897. Her imports of coke in 1898 amounted to only 332,578 tons, against 435,160 tons in 1897.

FRANCE.

The production of pig iron in France in 1898 was 2,534,427 metric tons, against 2,484,191 tons in 1897, 2,339,537 tons in 1896, and 2,003,868 tons in 1895. The production of Bessemer steel ingots in France in 1898 amounted to 905,995 tons, against 802,326 tons in 1897 and 726,463 tons in 1896, and the production of open-hearth steel ingots in 1898 to 535,638 tons, against 522,887 tons in 1897 and 454,280 tons in 1896. The total production of Bessemer and open-hearth steel ingots in 1898 was 1,441,633 tons, against 1,325,213 tons in 1897 and 1,180,743 tons in 1896. The production of finished steel in France in 1898 amounted to 1,138,633 tons, against 994,891 tons in 1897 and 916,817 tons in 1896. The production of steel rails in 1898, nearly all of which were made of Bessemer steel, amounted to 222,054 tons, against 191,860 tons in 1897, and 176,021 tons in 1896. These statistics are given upon the authority of the Comité des Forges de France and are provisional for 1898.

The production of iron ore in France in 1897, not including Algeria, amounted to 4,582,236 metric tons, against 4,062,390 tons in 1896. The iron ore mined in Algeria in 1897 amounted to 441,467 metric tons, against 374,476 tons in 1896. These are official figures. Official statistics for 1898 have not yet appeared.

The iron ore imported into France in 1898 amounted to 2,032,240 metric tons, against 2,137,901 tons in 1897. The imports from Algeria alone in 1898 amounted to 68,224 tons, against 64,802 tons in 1897. The exports of iron ore in 1898 amounted to 236,169 tons, against 289,694 tons in 1897.

The production of coal in France in 1898 amounted to 32,439,786 metric tons, against 30,797,629 tons in 1897, 29,189,900 tons in 1896, and 28,019,893 tons in 1895. The figures for 1898 are provisional. For 1896 and 1897 they are final.

BELGIUM.

The production of pig iron in Belgium in 1898 amounted to 979,101 metric tons, against 1,034,732 tons in 1897 and 959,414 tons in 1896. The production of steel ingots in Belgium in 1898 amounted to 653,130 metric tons, against 616,604 tons in 1897 and 598,974 tons in 1896. The production of finished steel in Belgium in 1898 amounted to 558,995 tons, against 525,731 tons in 1897 and 519,311 tons in 1896. The production of steel rails in Belgium in 1897 amounted to 136,911 metric tons, against 147,183 tons in 1896.

The imports of pig iron into Belgium in 1897 amounted to 288,956 metric tons, against 314,555 tons in 1896 and 225,665 tons in 1895. The exports in 1897 amounted to 10,381 tons, against 10,744 tons in 1896 and 9,864 tons in 1895.

The production of iron ore in Belgium in 1897 amounted to 240,774 metric tons, against 307,031 tons in 1896 and 312,637 tons in 1895.

The exports of iron ore in 1897 amounted to 410,817 tons, against 389,235 tons in 1896 and 325,809 tons in 1895. The imports of iron ore in 1897 amounted to 2,544,377 tons, against 2,069,676 tons in 1896 and 1,857,624 tons in 1895. The figures for 1898 have not yet appeared.

The production of coal in Belgium in 1898 amounted to 22,075,093 metric tons, against 21,534,629 tons in 1897 and 21,252,370 tons in 1896. The imports of coal into Belgium in 1897 amounted to 2,017,344 tons, against 1,693,376 tons in 1896 and 1,530,364 tons in 1895. The exports of coal in 1897 amounted to 4,448,544 tons, against 4,649,799 tons in 1896 and 4,661,477 tons in 1895.

AUSTRIA-HUNGARY.

The production of pig iron in Austria alone in 1897 was 887,945 metric tons, against 816,967 tons in 1896 and 778,510 tons in 1895. In Hungary the production in 1897 amounted to 420,478 tons, against 400,815 tons in 1896 and 349,163 tons in 1895. The production of both countries in 1897 was 1,308,423 tons, against 1,217,782 tons in 1896 and 1,127,673 tons in 1895. Statistics for 1898 are not yet at hand.

According to Prof. Franz Kupelwieser, of Leoben, Austria, the production of Bessemer and open-hearth steel in Austria-Hungary in 1896 amounted to 880,696 metric tons, of which 343,861 tons were produced by the Bessemer process and 536,835 tons by the open-hearth process. Of the Bessemer steel produced in the year named, 223,758 tons were made by the basic process and 120,103 tons were made by the acid process. Of the open-hearth steel produced, 513,835 tons were made by the basic process and 23,000 tons by the acid process. Hungary contributed 294,689 tons of Bessemer and open-hearth steel to the total for 1896, Austria 582,707 tons, and Bosnia 3,300 tons of basic open-hearth steel. The last-named country first began to make steel in 1896. From 1890 to 1895 the production of Bessemer and open-hearth steel in Austria-Hungary was as follows: 1890, 499,600 tons; 1891, 486,038 tons; 1892, 511,411 tons; 1893, 569,676 tons; 1894, 660,426 tons; and 1895, 744,547 tons.

The production of iron ore in Austria alone in 1897 amounted to 1,613,876 metric tons, against 1,448,615 tons in 1896 and 1,384,911 tons in 1895. In Hungary the production amounted to 1,721,129 tons in 1897, 1,269,680 tons in 1896, and 955,262 tons in 1895. The total production of iron ore in the whole of Austria-Hungary amounted to 3,335,005 tons in 1897, 2,718,295 tons in 1896, and 2,340,173 tons in 1895.

The production of coal in Austria alone in 1897 amounted to 30,950,863 metric tons, of which 20,458,092 tons were brown coal and 10,492,771 tons were stone coal. The production of coal in Hungary in 1897 amounted to 4,988,554 tons, of which 3,870,530 tons were brown coal and 1,118,024 tons were stone coal. The total production of all kinds of coal in the Austro-Hungarian Empire in 1897 amounted to 35,939,417 tons, against 33,676,411 tons in 1896 and 32,654,777 tons in 1895.

SWEDEN.

The production of pig iron in Sweden in 1897 was 538,197 metric tons, against 494,418 tons in 1896 and 462,930 tons in 1895. The production in 1898 was about 520,000 tons. The production of Bessemer steel ingots in Sweden in 1897 was 107,679 tons, against 114,120 tons in 1896, and the production of open-hearth steel ingots was 165,836 tons, against 142,301 tons in 1896. The production of blister and crucible steel in 1897 was 1,613 tons, against 1,228 tons in 1896. The total production of all kinds of steel in Sweden in 1897 was 275,128 tons, against 257,649 tons in 1896 and 197,830 tons in 1895.

The production of iron ore in Sweden in 1897 was 2,087,166 metric tons, against 2,039,019 tons in 1896 and 1,904,662 tons in 1895. The production of coal in Sweden in 1897 was 224,343 tons, against 225,848 tons in 1896 and 223,652 tons in 1895. The exports of iron ore from Sweden in 1897 amounted to 1,400,399 metric tons, against 1,150,695 tons in 1896, 800,452 tons in 1895, 831,395 tons in 1894, 484,055 tons in 1893, and 320,071 tons in 1892. The output of the Gellivara mines in 1898 was 851,000 tons, of which 804,730 tons were shipped to foreign countries, Germany and Belgium being the chief importers.

NORWAY.

The iron industry of this country, never extensive, has now only a nominal existence. The quantity of iron ore produced in 1895 was 1,250 metric tons, and in 1896 it was about 2,000 tons. There is no coal mined in Norway.

SPAIN.

The production of iron ore in Spain in 1897 appears to have been the largest in the history of the country, amounting to 7,419,768 metric tons, against 6,762,582 tons in 1896 and 5,514,339 tons in 1895. There were exported 6,884,588 tons in 1897, against 6,272,588 tons in 1896, of which Great Britain took 5,091,027 tons in 1897 and 4,635,959 tons in 1896. The production in 1898 is given as 7,125,600 tons, of which 6,558,060 tons were exported, Great Britain receiving 4,748,557 tons.

The production of pig iron in Spain in 1898 is reported to have amounted to 261,799 metric tons, against 297,100 tons in 1897, 246,326 tons in 1896, and 206,452 tons in 1895. The production of Bessemer steel ingots in Spain in 1898 is said to have been 154,910 metric tons, against 68,500 tons in 1897 and 62,511 tons in 1896. The production of open-hearth steel ingots in 1898 is given as 58,105 tons, against 52,600 tons in 1897 and 42,066 tons in 1896.

The reported production of coal and lignite in Spain in 1898 was 2,526,600 metric tons, against 2,073,632 tons in 1897. Of the total quantity produced last year 59,800 tons were classed as lignite, against 54,232 tons in 1897. The imports of coal into Spain in 1898 amounted

to 1,215,554 tons, against 1,633,333 tons in 1897. The exports of coal from Spain in 1898 amounted to 321,739 tons, against 298,520 tons in 1897. Spain annually imports a large part of the coke she consumes, as the following figures for 1898 will show: Production, 308,375 tons; imports, 231,467 tons; consumption, 539,842 tons.

PORTUGAL.

This country does not appear to have any kind of an iron industry. Its production of coal is only nominal, amounting in 1897 to 17,338 metric tons. It produces small quantities of manganese ore annually.

ITALY.

The production of pig iron in Italy in 1897 amounted to 8,393 metric tons, against 6,987 tons in 1896 and 9,213 tons in 1895. The production of finished steel in 1897 amounted to 63,940 tons, against 65,955 tons in 1896 and 50,314 tons in 1895.

Italy annually imports pig iron in considerable quantities, the imports in 1897 amounting to 164,268 metric tons, chiefly from Great Britain, the United States, Austria-Hungary, Spain, and Belgium in the order named. She also annually exports a small quantity of pig iron, her exports in 1897 amounting to 498 tons. Italy is also a large importer of iron and steel in finished forms.

The production of iron ore in Italy in 1897 amounted to 200,709 metric tons, of which all but 2,393 tons were produced on the island of Elba, against a total production of 203,966 tons in 1896 and 183,371 tons in 1895.

The exports of iron ore from Italy in 1897, in which are probably included small quantities of pyrites and manganese ores, amounted to 207,619 metric tons, against 187,059 tons in 1896 and 164,367 tons in 1895. The exports in 1897 were chiefly to Great Britain and France. The imports of iron ore into Italy are nominal, and amounted in 1897 to only 5,831 tons.

The production of anthracite, lignite, fossiliferous, and bituminous coal in Italy in 1897 amounted to 314,222 metric tons, against 276,197 tons in 1896 and 305,321 tons in 1895.

In 1897 the imports of coal and coke into Italy amounted to 4,259,643 metric tons, chiefly from Great Britain, Austria-Hungary, Germany, France, and Belgium. In 1896 the imports of these articles amounted to 4,081,218 tons, against 4,304,787 tons in 1895. In 1897 the exports of coal and coke from Italy amounted to 23,191 tons.

RUSSIA.

According to a recent issue of the Bulletin Russe de Statistique Financière et de Législation the production of pig iron in Russia and Finland in 1897 amounted to 1,868,671 metric tons, against 1,612,069

tons in 1896, 1,452,380 tons in 1895, 1,332,505 tons in 1894, 1,148,937 tons in 1893, 1,071,813 tons in 1892, 1,004,923 tons in 1891, and 926,482 tons in 1890. Preliminary statistics published by the "ministry of agriculture on mines" give the production in 1898 as 2,193,750 tons.

The Bulletin Russe says that the production of all kinds of steel in Russia, including Finland, amounted in 1895 to 879,075 metric tons, as compared with 726,017 tons in 1894, 630,796 tons in 1893, 514,986 tons in 1892, 433,477 tons in 1891, and 378,422 tons in 1890. The "ministry of agriculture on mines" gives the production of steel in 1896 as 1,006,616 tons. The production of steel ingots in Russia in 1897 is given by another authority as amounting to 1,153,000 metric tons and the production of rolled steel to 868,000 metric tons.

The Bulletin Russe says that the production of coal and lignite in Russia amounted to 11,119,849 metric tons in 1897, against 9,463,300 tons in 1896, 9,098,800 tons in 1895, 8,762,600 tons in 1894, 7,122,500 tons in 1893, 6,946,200 tons in 1892, 6,233,200 tons in 1891, and 6,015,000 tons in 1890. The production of lignite in Russia is very small, amounting in 1895 to only 133,000 tons.

According to the same authority the production of iron ore in Russia amounted to 2,924,963 metric tons in 1895, against 2,484,938 tons in 1894, 2,194,102 tons in 1893, 2,044,106 tons in 1892, 1,958,452 tons in 1891, and 1,795,663 tons in 1890. The production in 1896 is reported by the "ministry of agriculture on mines" as having amounted to 3,268,400 tons.

Russia is rich in manganese, of which it furnishes about one-half of the world's supply. The productive mines are found in the Caucasus Mountains, near the town of Chiaturi, in the Province of Kutais. They are connected by a narrow-gauge railroad with Sharopan, 25 miles distant, on the Trans-Caucasian Railway, which carries the ore to Poti and Batum, on the Black Sea. The production in 1897 in the whole of Russia was 366,513 tons, the largest ever attained.

GREECE.

This country produces considerable quantities of manganiferous iron ore and small quantities of magnetic iron ore. In 1895 the total production was 338,957 metric tons, and in 1896 it was 415,987 tons, nearly all being manganiferous iron ore. It is also a small producer of lignite, the quantity mined in 1895 amounting to 14,068 metric tons, and in 1896 to 13,812 tons.

JAPAN.

Various statements agree in reporting Japan as on the eve of inaugurating on an extensive scale modern methods of making iron and steel, and to this end it is circumstantially stated that a contract has recently been entered into by the Japanese Government for the shipment to

Japan of 500,000 tons of Bessemer iron ore from San Isidro, a point on the beach about 50 miles south of Ensenada, on the coast of Lower California.

The production of coal in Japan has rapidly increased in late years. Ten years ago it was about 2,000,000 tons annually, but in 1897 it is said to have amounted to about 6,000,000 tons. The actual production was 4,301,420 metric tons in 1894, 4,809,873 tons in 1895, and 5,019,690 tons in 1896. A large part of the coal produced in Japan is exported, the exports in 1897 amounting to over 2,500,000 tons, the shipments being to China, Australasia, Korea, and other Eastern countries.

CHINA.

It is impossible to make a satisfactory estimate of the production of coal in China, and the same remark may be made of its iron-ore production. The production of iron and steel in China by modern methods is almost entirely confined to the Government works at Hanyang, for which we have in *Le Moniteur des Intérêts Matériels* circumstantial statistics for 1897. It says: "Only one furnace was in blast during the year, its outturn having been 24,022 tons of pig iron. The Bessemer converter treated 9,206 tons of pig iron and yielded 8,350 tons of steel ingots, while the open-hearth furnace produced 2,116 tons."

A correspondent in China of the American Iron and Steel Association writes that, in addition to the Hanyang works, "there are several arsenals located at different places which produce open-hearth steel in very limited quantities. The best equipped plant is the one at Shanghai. It has splendid machinery for making the very heaviest guns, also for forged armor plate, having a press exactly like the one at Homestead, Pennsylvania, built by the same people. They have the very latest patterns of guns from Armstrong and Krupp."

INDIA.

The total production of coal in India in 1897 was 4,063,127 long tons, against 3,848,013 tons in 1896, 3,537,820 tons in 1895, 2,820,652 tons in 1894, and 2,562,001 tons in 1893. The principal coal mines in India are situated in Bengal.

AUSTRALASIA.

The production of coal in 1897 in this division of the British Empire was as follows, in long tons: Queensland, 358,407 tons; New South Wales, 4,383,591 tons; New Zealand, 840,713 tons; Victoria, 236,277 tons of coal and 3,918 tons of lignite; Tasmania, 48,501 tons; total, 5,871,407 tons. The production of New South Wales in 1898 was 4,736,000 tons.

SOUTH AFRICAN REPUBLIC.

This new political division, formerly the Transvaal Republic, produced 1,494,798 metric tons of coal in 1896 and 1,625,892 tons in 1897.

DOMINION OF CANADA.

The production of coal in the Dominion of Canada in 1898 is reported to have amounted to 3,725,585 long tons, against 3,380,453 tons in 1897. The production of coke, all made in Nova Scotia and British Columbia, amounted to 64,682 long tons in 1898, against 54,184 tons in 1897. The production of iron ore in 1898 was 51,929 long tons, against 45,272 tons in 1897. The figures for 1898 are all subject to revision.

The production of pig iron in the Dominion of Canada in 1898, as ascertained from the manufacturers by the American Iron and Steel Association, was 68,755 long tons, against 53,796 tons in 1897. The production of open-hearth and Bessemer steel in Canada in 1898, as ascertained by the same authority, was 21,540 long tons, against 18,400 tons in 1897. The production of all kinds of iron and steel rolled into finished forms, excluding muck and scrap bars, billets, etc., but including cut nails and cut spikes, amounted to 90,303 long tons in 1898, against 77,021 tons in 1897 and 75,043 tons in 1896.

The imports of pig iron into Canada in the fiscal year ending June 30, 1898, amounted to 35,812 tons, of which 2,009 tons were charcoal pig iron and 33,803 tons were other grades. In 1897 the imports of pig iron amounted to 25,650 tons, of which 2,622 tons were charcoal and 23,028 tons were other grades.

NEWFOUNDLAND.

The production of iron ore in Newfoundland in 1897 amounted to 58,940 long tons, against 38,450 tons in 1896. Newfoundland is not embraced in the Dominion of Canada.

BRAZIL.

A large part of the manganese ore which is now imported into the United States comes from Brazil. Deposits are found in the States of S. Paulo, Minas Geraes, and Matto Grosso, but the only mines in operation are in Minas Geraes. About 95 per cent of the manganese exported from Brazil is obtained at the mines of Carlos Wigg, near Miguel Burnier, in Minas. The Carnegie Steel Company has taken most of the product of these mines for several years, but a cargo has recently been delivered at Fleetwood, England.

BOLIVIA.

Tin mines, producing tin ore of good quality, have been opened on the eastern cordillera of the Andes Mountains. There are no trustworthy statistics of production.

DETAILED STATISTICS OF THE CANADIAN IRON TRADE FOR 1898.

The production of pig iron in the Dominion of Canada was first ascertained from the manufacturers by the American Iron and Steel Association for the year 1894, when it amounted to 44,791 long tons. In

1895 the production amounted to 37,829 tons, in 1896 to 60,030 tons, and in 1897 to 53,796 tons. In 1898 the production amounted to 68,755 tons, of which about one-eleventh was charcoal iron, the remainder being coke iron. The production of Bessemer pig iron in 1898, included in the figures given above, was 10,200 tons, and the production of basic pig iron was 9,100 tons, all made by one company. The total production of pig iron in 1898, as compared with that of 1897, shows an increase of 14,959 tons. The consumption of limestone by the Canadian furnaces in 1898 amounted to 30,302 tons, against 27,957 tons in 1897.

On December 31, 1898, the unsold stocks of pig iron in Canada which were in the hands of the manufacturers or their agents amounted to 9,979 tons, as compared with 20,265 tons on December 31, 1897, 29,320 tons on December 31, 1896, and 17,800 tons on December 31, 1895. Of the unsold pig iron on hand on December 31, 1898, about four-fifths was charcoal pig iron, the remainder being coke iron.

Canada did not produce any spiegeleisen or ferro-manganese in 1897 or 1898, although some time ago the Mineral Products Company, of Hillsboro, New Brunswick, leased the Bridgeville Furnace, at Bridgeville, Nova Scotia, for this purpose, and expected to have the furnace in operation in 1898. The company blew in the furnace on May 11, 1899. The ferro-manganese is made from briquettes of manganese ore. The annual capacity of the furnace is about 7,300 gross tons.

On December 31, 1898, there were 9 completed blast furnaces in the Dominion, and of this number 3 were in blast and 6 were out of blast on the date named. On December 31, 1897, there were 8 completed furnaces, of which 4 were in blast and 4 were idle. In the spring of 1898 the Deseronto Iron Company Limited began building a charcoal furnace at Deseronto, in the Province of Ontario, which it completed in December. The furnace was blown in on January 25, 1899. It is now making about 1,000 tons of pig iron per month from Lake Superior ores.

The production of crude steel, steel castings, and all kinds of iron and steel rolled into finished forms in Canada in 1898 is given approximately below, full reports or careful estimates having been received by us from all the manufacturers in the Dominion.

The production of Bessemer and of basic and acid open-hearth steel ingots and castings in 1898 was 21,540 long tons, against 18,400 tons in 1897, 16,000 tons in 1896, and 17,000 tons in 1895. Of the total production of open-hearth steel in 1898 a little more than one-half was made by the acid process. The production of open-hearth steel rails in 1898 amounted to 600 tons, against 500 tons in 1897; structural shapes, 1,565 tons, against 4,300 tons in 1897; cut nails made by rolling mills and steel works having cut-nail factories connected with their plants, 152,688 kegs of 100 pounds, against 202,939 kegs in 1897; plates and sheets, about 1,000 tons, against about 2,000 tons in 1897; all other

rolled products, excluding muck and scrap bar, blooms, billets, sheet bars, etc., 80,322 tons, against 61,161 tons in 1897. Changing the cut-nail production from kegs of 100 pounds to long tons of 2,240 pounds the total quantity of all kinds of iron and steel rolled into finished products in the Dominion in 1898, excluding muck and scrap bar, billets, and other intermediate products, amounted to 90,303 tons, against 77,021 tons in 1897, 75,043 tons in 1896, and 66,402 tons in 1895.

The total number of rolling mills and steel works in Canada on December 31, 1898, was 18. Of this number at least four were idle during the whole of 1898. Canada has only one steel-casting plant, which is equipped with a 3,000-pound modified acid Bessemer converter. Its first castings were produced in 1897. Canada also has one open-hearth steel plant, which makes steel by both the acid and basic processes.

THE WORLD'S PRODUCTION OF PIG IRON AND STEEL.

In the following table is given the production of pig iron and steel in all countries in 1898 or in the most recent year for which statistics have been received. English tons of 2,240 pounds are used for Great Britain, Canada, the United States, and "other countries," and metric tons of 2,204 pounds for all other countries, metric tons being used as the equivalent of English tons in ascertaining the total production for all countries.

World's production of pig iron and steel.

Countries.	Pig Iron.			Steel.		
	Year.	Production.	Percent- age.	Year.	Production.	Percent- age.
		<i>Tons.</i>			<i>Tons.</i>	
United States	1898	11, 773, 934	33. 02	1898	8, 932, 857	37. 02
Great Britain	1898	8, 631, 151	24. 21	1898	4, 665, 986	19. 33
Germany and Lux- emburg	1898	7, 232, 988	20. 29	1898	5, 779, 570	23. 96
France	1898	2, 534, 427	7. 11	1898	1, 473, 100	6. 11
Belgium	1898	979, 101	2. 75	1898	653, 130	2. 71
Austria and Hun- gary	1897	1, 308, 493	3. 67	1896	880, 696	3. 65
Russia and Finland.	1898	2, 193, 750	6. 15	1897	1, 153, 000	4. 78
Sweden	1897	538, 197	1. 51	1897	275, 128	1. 14
Spain	1898	261, 799	. 73	1898	213, 015	. 88
Italy	1897	8, 393	. 02	1897	63, 940	. 27
Canada	1898	68, 755	. 19	1898	21, 540	. 09
Other countries	1897	125, 000	. 35	1897	15, 000	. 06
Total		35, 655, 988	100. 00		24, 126, 962	100. 00

GOLD AND SILVER.

PRODUCTION.

The statistics of production of gold and silver prepared by the Director of the Mint are accepted as official in this report. They show that both gold and silver increased in total amount produced in 1898. Thus, 3,118,398 fine ounces of gold were produced in 1898 against 2,774,935 fine ounces in 1897. Two-thirds of this increase came from Colorado, chiefly from the Cripple Creek district, while California also increased about 50,000 ounces. The yield from the American mines in Alaska reach 122,137 fine ounces, a gain of 36,126 ounces over 1897.

In regard to silver, the total product in 1898 was 54,433,000 ounces compared with 53,860,000 in 1897. The greatest increase in silver was, like gold, from Colorado, where the product exceeded that of 1897 by over a million ounces. This was partly offset by a decrease of 860,700 ounces of silver in Montana. The entire production by States is given in the table which follows:

Approximate distribution, by producing States and Territories, of the product of gold and silver in the United States for the calendar year 1898.

[As estimated by the Director of the Mint.]

State or Territory.	Gold.		Silver.		Total value.
	Fine ounces.	Value.	Fine ounces.	Coining value.	
Alabama	242	\$5,000	100	\$129	\$5, 129
Alaska	122, 137	2, 524, 800	92, 400	119, 467	2, 644, 267
Arizona	119, 249	2, 465, 100	2, 246, 800	2, 904, 954	5, 370, 054
California	756, 483	15, 637, 900	642, 300	830, 448	16, 468, 348
Colorado	1, 122, 073	23, 195, 300	22, 815, 600	29, 498, 958	52, 694, 258
Georgia	6, 221	128, 600	500	646	129, 246
Idaho	83, 055	1, 716, 900	5, 073, 800	6, 560, 065	8, 276, 965
Iowa	5	100			100
Maryland	29	600			600
Michigan	5	100	32, 400	41, 891	41, 991
Minnesota	5	100			100
Montana	248, 014	5, 126, 900	14, 807, 200	19, 144, 663	24, 271, 563
Nevada	144, 859	2, 994, 500	805, 000	1, 040, 808	4, 035, 308
New Mexico....	26, 074	539, 000	425, 300	549, 883	1, 088, 883
North Carolina.	4, 064	84, 000	700	905	84, 905
Oregon	56, 966	1, 177, 600	130, 000	168, 081	1, 345, 681
South Carolina.	5, 041	104, 200	300	388	104, 582
South Dakota ..	275, 723	5, 699, 700	152, 300	196, 913	5, 896, 613
Tennessee	43	900			900

Approximate distribution, by producing States and Territories, etc.—Continued.

State or Territory.	Gold.		Silver.		Total value.
	Fine ounces.	Value.	Fine ounces.	Coining value.	
Texas	14	\$300	472,900	\$611,426	\$611,726
Utah	110,556	2,285,400	6,485,900	8,385,810	10,671,210
Virginia	218	4,500	.....	.....	4,500
Washington.....	37,065	766,200	254,400	328,921	1,095,121
Wyoming	257	5,300	100	129	5,429
Total	3,118,398	64,463,000	54,438,000	70,384,485	134,847,485

Approximate distribution, by producing States and Territories, of the product of gold and silver in the United States for the calendar year 1897.

[As estimated by the Director of the Mint.]

State or Territory.	Gold.		Silver.		Total value.
	Fine ounces.	Value.	Fine ounces.	Coining value.	
Alabama	358	\$7,400	100	\$129	\$7,529
Alaska	86,011	1,778,000	116,400	150,497	1,928,497
Arizona	140,089	2,895,900	2,239,900	2,896,032	5,791,932
California.....	707,160	14,618,300	474,400	613,366	15,231,666
Colorado	924,166	19,104,200	21,636,400	27,974,335	47,078,535
Georgia	7,222	149,300	600	776	150,076
Idaho	82,320	1,701,700	4,901,200	6,336,905	8,038,605
Iowa	5	100	.....	.....	100
Maryland	5	100	.....	.....	100
Michigan	3,033	62,700	60,300	77,964	140,664
Minnesota.....	145	3,000	.....	.....	3,000
Montana	211,563	4,373,400	15,667,900	20,257,487	24,630,887
Nevada	143,983	2,976,400	1,228,900	1,588,881	4,565,281
New Mexico....	17,246	356,500	539,500	697,535	1,054,035
North Carolina.	1,674	34,600	300	388	34,988
Oregon.....	65,456	1,353,100	69,000	89,212	1,442,312
South Carolina.	4,097	84,700	200	259	84,959
South Dakota..	275,491	5,694,900	147,600	190,836	5,885,736
Tennessee	5	100	.....	.....	100
Texas	358	7,400	404,700	523,249	530,649
Utah	83,500	1,726,100	6,265,600	8,100,978	9,827,078
Vermont	5	100	.....	.....	100
Virginia	189	3,900	.....	.....	3,900
Washington.....	20,312	419,900	106,900	138,214	558,114
Wyoming	542	11,200	100	129	11,329
Total	2,774,935	57,363,000	53,860,000	69,637,172	127,000,172

GOLD AND SILVER.

105

Approximate distribution, by producing States and Territories, of the product of gold and silver in the United States for the calendar year 1896.

[As estimated by the Director of the Mint.]

State or Territory.	Gold.		Silver.		Total value.
	Fine ounces.	Value.	Fine ounces.	Coining value.	
Alabama	275	\$5,700			\$5,700
Alaska	99,444	2,055,700	145,300	\$187,863	2,243,563
Arizona	125,978	2,604,200	1,913,000	2,473,373	5,077,573
California	737,036	15,235,900	600,600	776,533	16,012,433
Colorado	721,320	14,911,000	22,573,000	29,185,293	44,096,293
Georgia	7,305	151,000	600	776	151,776
Idaho	104,263	2,155,300	5,149,900	6,658,457	8,813,757
Iowa	48	1,000			1,000
Maryland	15	300			300
Michigan	1,800	37,200	59,000	76,283	113,483
Minnesota	39	800			800
Montana	209,207	4,324,700	16,737,500	21,640,404	25,965,104
Nevada	119,404	2,468,300	1,048,700	1,355,895	3,824,195
New Mexico	23,017	475,800	687,800	889,277	1,365,077
North Carolina	2,143	44,300	500	646	44,946
Oregon	60,517	1,251,000	61,100	78,998	1,329,998
South Carolina	3,062	63,300	300	388	63,688
South Dakota	240,414	4,969,800	229,500	296,727	5,266,527
Tennessee	15	300			300
Texas	387	8,000	525,400	679,305	687,305
Utah	91,908	1,899,900	8,827,600	11,413,463	13,313,363
Vermont	48	1,000			1,000
Virginia	169	3,500			3,500
Washington	19,626	405,700	274,900	355,426	761,126
Wyoming	692	14,300	100	129	14,429
Total	2,568,132	53,088,000	58,834,800	76,069,236	129,157,236

MINERAL RESOURCES.

Production of gold in the United States in 1897 and 1898, and the increase or decrease in 1898, by States and Territories.

[Fine ounces.]

State or Territory.	1897.	1898.	Increase.	Decrease.
Alaska	86, 011	122, 137	36, 126	.....
Arizona	140, 089	119, 249	.....	20, 840
California	707, 160	756, 483	49, 323	.....
Colorado	924, 166	1, 122, 073	197, 907	.....
Georgia	7, 222	6, 221	.....	1, 001
Idaho	82, 320	83, 055	735	.....
Michigan	3, 033	5	.....	3, 028
Montana	211, 563	248, 014	36, 451	.....
Nevada	143, 983	144, 859	876	.....
New Mexico	17, 246	26, 074	8, 828	.....
North Carolina	1, 674	4, 064	2, 390	.....
Oregon	65, 456	56, 966	.....	8, 490
South Carolina	4, 097	5, 041	944	.....
South Dakota	275, 491	275, 723	232	.....
Texas	358	14	.....	344
Utah	83, 500	110, 556	27, 056	.....
Washington	20, 312	37, 065	16, 753	.....
Alabama	1, 254	799	.....	455
Connecticut				
Iowa				
Maryland				
Minnesota				
Nebraska				
Tennessee				
Vermont				
Virginia	4	.....	.....	.....
Wyoming				
Total	2, 774, 935	3, 118, 398	343, 463	.....

GOLD AND SILVER.

107

Production of silver in the United States in 1897 and 1898, and the increase or decrease in 1898, by States and Territories.

[Fine ounces.]

State or Territory.	1897.	1898.	Increase.	Decrease.
Alaska	116,400	92,400	.....	24,000
Arizona	2,239,900	2,246,800	6,900	.....
California	474,400	642,300	167,900	.....
Colorado	21,636,400	22,815,600	1,179,200	.....
Georgia	600	500	.....	100
Idaho	4,901,200	5,073,800	172,600	.....
Michigan	60,300	32,400	.....	27,900
Montana	15,667,900	14,807,200	.....	860,700
Nevada	1,228,900	805,000	.....	423,900
New Mexico	539,500	425,300	.....	114,200
North Carolina	300	700	400	.....
Oregon	69,000	130,000	61,000	.....
South Carolina	200	300	100	.....
South Dakota	147,600	152,300	4,700	.....
Texas	404,700	472,900	68,200	.....
Utah	6,265,600	6,485,900	220,300	.....
Washington	106,900	254,400	147,500	.....
Alabama				
Connecticut				
Minnesota				
Nebraska	200	200	.....	.....
Tennessee				
Virginia				
Wyoming				
Total	53,860,000	54,438,000	578,000	.....

MINERAL RESOURCES.

Production of gold in the United States in 1896 and 1897, and the increase or decrease in 1897, by States and Territories.

[Fine ounces.]

State or Territory.	1896.	1897.	Increase.	Decrease.
Alaska	99,444	86,011	.....	13,433
Arizona	125,978	140,089	14,111	.....
California	737,036	707,160	.....	29,876
Colorado	721,320	924,166	202,846	.....
Georgia	7,305	7,222	.....	83
Idaho	104,263	82,320	.....	21,943
Michigan	1,800	3,033	1,233	.....
Montana	209,207	211,563	2,356	.....
Nevada	119,404	143,983	24,579	.....
New Mexico	23,017	17,246	.....	5,771
North Carolina	2,143	1,674	.....	469
Oregon	60,517	65,456	4,939	.....
South Carolina	3,062	4,097	1,035	.....
South Dakota	240,414	275,491	35,077	.....
Texas	387	358	.....	29
Utah	91,908	83,500	.....	8,408
Washington	19,626	20,312	686	.....
Alabama	1,301	1,254	.....	47
Connecticut				
Iowa				
Maryland				
Minnesota				
Nebraska				
Tennessee				
Vermont .....	.....	.....	.....	.....
Virginia				
Wyoming				
Total	2,568,132	2,774,935	206,803	.....

GOLD AND SILVER.

109

Production of silver in the United States in 1896 and 1897, and the increase or decrease in 1897, by States and Territories.

[Fine ounces.]

State or Territory.	1896.	1897.	Increase.	Decrease.
Alaska	145,300	116,400		28,900
Arizona	1,913,000	2,239,900	326,900	
California	600,600	474,400		126,200
Colorado	22,573,000	21,636,400		936,600
Georgia	600	600		
Idaho	5,149,900	4,901,200		248,700
Michigan	59,000	60,300	1,300	
Montana	16,737,500	15,667,900		1,069,600
Nevada	1,048,700	1,228,900	180,200	
New Mexico	687,800	539,500		148,300
North Carolina	500	300		200
Oregon	61,100	69,000	7,900	
South Carolina	300	200		100
South Dakota	229,500	147,600		81,900
Texas	525,400	404,700		120,700
Utah	8,827,600	6,265,600		2,562,000
Washington	274,900	106,900		168,000
Alabama				
Connecticut				
Minnesota				
Nebraska	100	200	100	
Tennessee				
Virginia				
Wyoming				
Total	58,834,800	53,860,000		4,974,800

MINERAL RESOURCES.

Product of gold and silver in the United States from 1792.

[The estimate for 1792 to 1873 is by Dr. R. W. Raymond, United States Mining Commissioner, and since by the Director of the Mint.]

Year.	Total.	Gold.	Silver.
April 2, 1792, to July 31, 1834	\$14, 000, 000	\$14, 000, 000	Small.
July 31, 1834, to Dec. 31, 1844	7, 750, 000	7, 500, 000	\$250, 000
1845.....	1, 058, 327	1, 008, 327	50, 000
1846.....	1, 189, 357	1, 139, 357	50, 000
1847.....	939, 085	889, 085	50, 000
1848.....	10, 050, 000	10, 000, 000	50, 000
1849.....	40, 050, 000	40, 000, 000	50, 000
1850.....	50, 050, 000	50, 000, 000	50, 000
1851.....	55, 050, 000	55, 000, 000	50, 000
1852.....	60, 050, 000	60, 000, 000	50, 000
1853.....	65, 050, 000	65, 000, 000	50, 000
1854.....	60, 050, 000	60, 000, 000	50, 000
1855.....	55, 050, 000	55, 000, 000	50, 000
1856.....	55, 050, 000	55, 000, 000	50, 000
1857.....	55, 050, 000	55, 000, 000	50, 000
1858.....	50, 500, 000	50, 000, 000	500, 000
1859.....	50, 100, 000	50, 000, 000	100, 000
1860.....	46, 150, 000	46, 000, 000	150, 000
1861.....	45, 000, 000	43, 000, 000	2, 000, 000
1862.....	43, 700, 000	39, 200, 000	4, 500, 000
1863.....	48, 500, 000	40, 000, 000	8, 500, 000
1864.....	57, 100, 000	46, 100, 000	11, 000, 000
1865.....	64, 475, 000	53, 225, 000	11, 250, 000
1866.....	63, 500, 000	53, 500, 000	10, 000, 000
1867.....	65, 225, 000	51, 725, 000	13, 500, 000
1868.....	60, 000, 000	48, 000, 000	12, 000, 000
1869.....	61, 500, 000	49, 500, 000	12, 000, 000
1870.....	66, 000, 000	50, 000, 000	16, 000, 000
1871.....	66, 500, 000	43, 500, 000	23, 000, 000
1872.....	64, 750, 000	36, 000, 000	28, 750, 000
1873.....	71, 750, 000	36, 000, 000	35, 750, 000
1874.....	70, 800, 000	33, 500, 000	37, 300, 000
1875.....	65, 100, 000	33, 400, 000	31, 700, 000
1876.....	78, 700, 000	39, 900, 000	38, 800, 000
1877.....	86, 700, 000	46, 900, 000	39, 800, 000
1878.....	96, 400, 000	51, 200, 000	45, 200, 000
1879.....	79, 700, 000	38, 900, 000	40, 800, 000
1880.....	75, 200, 000	36, 000, 000	39, 200, 000
1881.....	77, 700, 000	34, 700, 000	43, 000, 000
1882.....	79, 300, 000	32, 500, 000	46, 800, 000
1883.....	76, 200, 000	30, 000, 000	46, 200, 000

Product of gold and silver in the United States—Continued.

Year.	Total.	Gold.	Silver.
1884.....	\$79,600,000	\$30,800,000	\$48,800,000
1885.....	83,400,000	31,800,000	51,600,000
1886.....	86,000,000	35,000,000	51,000,000
1887.....	86,350,000	33,000,000	53,350,000
1888.....	92,370,000	33,175,000	59,195,000
1889.....	97,446,000	32,800,000	64,646,000
1889.....	99,282,866	32,886,180	66,396,686
1890.....	103,330,714	32,845,000	70,485,714
1891.....	108,591,565	33,175,000	75,416,565
1892.....	115,101,000	33,000,000	82,101,000
1893.....	113,531,000	35,955,000	77,576,000
1894.....	103,500,000	39,500,000	64,000,000
1895.....	118,661,000	46,610,000	72,051,000
1896.....	129,157,236	53,088,000	76,069,236
1897.....	127,000,172	57,363,000	69,637,172
1898.....	134,847,485	64,463,000	70,384,485

HISTORY OF GOLD MINING AND METALLURGY IN THE SOUTHERN STATES.¹

By H. B. C. NITZE.

For the probable earliest discoveries of gold by the Spanish explorers, in what is now the southern part of the United States, the reader is referred to Mr. George F. Becker's paper, *Reconnaissance of the Gold Fields of the Southern Appalachians*.² Reports of the existence of gold in the Southern States antedate the Revolutionary war, as, for instance, in South Carolina, at the Brewer mine, and in North Carolina at the Oliver, Dunn, and Parker (Cherokee County) mines. However, no absolutely authentic references to these can be obtained, and the date of the first actual discovery of gold in this country must remain shrouded in uncertainty.

Jefferson, in his *Notes on Virginia* (1782), mentions the discovery of a nugget containing 17 pennyweights of gold, 4 miles below the falls of the Rappahannock River. The United States mint reports give the first returns from Virginia in 1829. For North Carolina the first mint returns appear in 1793; but the first mention of any specific find of gold in this State is of a 17-pound nugget, discovered on the Reed plantation, in Cabarrus County, in 1799. Mills, in his *Statistics of South Carolina*, notes the occurrence of gold in the Abbeville and Spartanburg districts as early as 1826, but the first United States mint returns from this State are given in 1829. The gold placers of Burke and McDowell

¹ By courtesy of the North Carolina geological survey.² Sixteenth Annual Report of the United States Geological Survey, Part III, 1894-95

counties, North Carolina, were first worked in 1829, and were immediately traced southward through South Carolina into Georgia.

John Witheroods, of North Carolina, claims to have first discovered gold in Georgia in 1829, at Dukes Creek, near Nacoochee, Habersham County;¹ but Jesse Hogan, also of North Carolina, claims to have taken out gold previously in a branch of Wards Creek, near Dahlonega, which was then in the Cherokee Nation. The earliest mint returns from Georgia appear in 1830.

Dr. William B. Phillips² gives 1830 as the probable date of the first discovery of gold in Alabama. There were, however, no mint returns from this State until 1840.

Perhaps one of the chief reasons why the discovery of gold came so much later in Georgia and Alabama than it did in North Carolina and Virginia was that this part of the country was then occupied by the Cherokee Indian Nation, under the supervision of the United States, and was not open to white settlers, although the latter repeatedly intruded. After the discovery of gold, the long-pending efforts of the States to acquire these Indian lands were stimulated and accelerated by the added thirst for the precious metal, and were finally successful in 1830, when the State laws were extended over the nation, and the Indians were removed. The mining region in Georgia was surveyed into 40-acre lots, which were distributed by lottery. A caustic writer of the time said that "intrusive mining ceased then and there and swindling mining commenced."

The first mention of gold in Tennessee is from Coco Creek, Monroe County, in 1831;³ and this date corresponds with that of the first mint receipts.

The earliest record of gold in Maryland is in 1849,⁴ from the farm of Mr. Samuel Ellicot, in Montgomery County. The mint reports, however, shows no return previous to 1868.

The greatest activity of gold mining in the South seems to have followed closely the first discovery, being most marked from 1829 to 1836, and probably being due to the working of the more accessible virgin placers and more easily mined outcrops. The mint receipts show a renewed activity from 1839 to 1849, caused, perhaps, by more systematic vein explorations and improved methods. In the early fifties the Californian discoveries abated the interest in the Southern gold field and attracted the mining population westward, causing a natural decrease in the output. From that time on there was a general decrease until the practically total cessation caused by the civil war. Since then there have been spasmodic revivals and depressions, due undoubtedly in a great measure to local causes and excitements, and to the financial condition of the country at large. Considering the small total output of the South, such fluctuations may have been caused

¹ Now in White County, which was later formed from a part of Habersham.

² Geol. Survey Alabama, Bull. No. 3, 1892, p. 10.

³ Safford's Geology of Tennessee, 1869, p. 489.

⁴ Proc. Amer. Philosoph. Soc., 1849.

by the successful working of a single mine, as shown, for instance, by the increased production of South Carolina since 1890, owing to the revival of the Haile mine.

The first practical systematic mining operations appear to have been in North Carolina, beginning about the year 1800. From 1804 to 1827, inclusive, this State furnished all of the gold produced in the country, amounting to \$110,000. The progress up to 1820 was very slow, and mining was restricted to a very limited area. Professor Olmstead, the first State geologist of North Carolina, estimated¹ the extent of the then known gold field at 1,000 square miles. He says:

The gold country is spread over a space of not less than 1,000 square miles. With a map of North Carolina one may easily trace its boundaries, so far as they have been hitherto observed. From a point taken 8 miles west by south of the mouth of the Uwharrie, with a radius of 18 miles, describe a circle; it will include the greatest part of the county of Montgomery, the northern part of Anson, the northeastern corner of Mecklenburg, Cabarrus—a little beyond Concord on the west—and a corner of Rowan, and of Randolph. In almost any part of this region gold may be found in greater or less abundance, at or near the surface of the ground. Its true bed, however, is a thin stratum of gravel inclosed in a dense mud, usually of a pale blue, but sometimes of a yellowish color. * * * Rocky River and its small tributaries, which cut through this stratum, have hitherto proved the most fruitful localities of the precious metals.

In 1820 articles began to appear in the public journals calling attention to the North Carolina gold deposits, and itinerant German miners and mineralogists had already come into the country in some numbers. In 1821, when Olmstead wrote, there was a considerable mining population, whose average earnings were from 60 to 65 cents per day, approximately 65 to 70 cents in the present standard of gold coinage. The toll paid to the owners of the land varied from one-fourth to occasionally one-half of the yield. The dust became a considerable medium of circulation, and miners were accustomed to carry about with them quills filled with gold, and a pair of small hand scales, on which they weighed out gold at regular rates; for instance, $3\frac{1}{2}$ grains of gold was the customary equivalent of a pint of whisky. The gold found its way largely into the country stores in exchange for merchandise, at the rate of 90 to 91 cents per dwt., 96 to 97 cents, present standard.

In these early days farming and gold digging went, in many cases, hand in hand; and this is indeed still true, to some extent, at the present day. When the crops were laid by, the slaves and farm hands were turned into the creek bottoms, thus utilizing their time during the dull seasons. Where mining proved more profitable than planting, the former superseded the latter entirely. Thus, in speaking of the Tinder Flats placer in Louisa County, Virginia, Silliman says:²

Jenkins is in the habit of substituting a fall working in the gold, for which he obtains \$1,000 annually, as a compensation for his tobacco crop, which he relinquishes in favor of the gold.

¹ Amer. Jour. Sci., 1821.

² Report to the president and directors of the Walton Mining Company. By Prof. B. Silliman, Jr., Fredericksburg, Virginia, 1836.

Some of the more prominent localities developed into regular mining camps, where continuous and extensive operations were carried on. Such were, for instance, Arbacoochee and Goldville, Alabama; Auraria and Dahlonega, Georgia, and Gold Hill and Brindletown, North Carolina. In the latter place it is stated that just before the California excitement as many as 3,000 hands might have been seen at work on one of the streams of the region.¹ In 1853 there was a population of about 2,000 in the Gold Hill camp. When Lumpkin County, Georgia, was organized in 1832, Dahlonega (then called New Mexico) had a population of 800. During the mining boom Dahlonega had a population of 5,000, and Auraria (then called Knucklesville) 2,000 to 3,000.² At Goldville, Alabama, between 1840 and 1850, there was a population of at least 3,000.

The first work, naturally, was the washing of the stream placers. After these were exhausted attention was turned to the gravel deposits lying under cover of the alluvium. These were worked by sinking pits and raising the gravel by hand labor. Where it was necessary the pits were drained by large vertical bucket wheels, for which the power was derived from the stream directly, or by flume lines with overshot or undershot wheels.

The first primitive washing was probably done with the pan, as in other newly discovered gold countries. As the workings grew more extensive, this was superseded by the rocker, long tom and sluice box; and indeed these original devices survive to the present day. The rockers in use to-day are of two types. The first is essentially a panning process, using a minimum amount of water, the operation being an intermittent one. This type of rocker is closed at both ends, the discharge being over the sides. The second type consists of a hollow segment of a log closed at the upper end and set at a slight inclination, the lower end being provided with grooves or strips that act as mercury pockets or riffles.

Where sufficient flowing water is at hand the sluice box and long tom are used, as they handle larger quantities with less labor. The sluice box, generally 8 to 10 feet long, 20 inches wide, and 12 inches deep, provided with riffles and a perforated charging plate at the head, fulfills the same purpose as the rocker; being stationary, however, it requires a larger amount of water to carry off the tailings.

It is interesting to note that at the Beaver Dam mine, in Montgomery County, North Carolina, a large rocker about 10 feet long by 3 feet wide was operated as early as 1825 by steam power, the engine having been imported from England.

Tuomey,³ in 1854, mentions ground sluicing of side-hill deposits at Arbacoochee, Alabama, by aid of a ditch and a series of trenches into which quicksilver was poured.

¹ Ores of North Carolina, p. 312.

² Recollections of A. G. Wimfry, a very old citizen of Dahlonega, published in the Dahlonega Signal August 20, 1883.

³ Second Biennial Report on the Geology of Alabama, p. 70, Montgomery, 1858.

The first use of the hydraulic method of mining was probably early in the forties (previous to the California gold discoveries), in the western part of North Carolina, although on a much smaller and modified scale as compared to its present application. Mr. William H. Ellet, writing in the *Mining and Statistic Magazine*,¹ early in 1858, in reply to Hon. T. L. Clingman's inquiry of December, 1857, says:

I avail myself of my earliest leisure to answer your inquiries in relation to the hydraulic gold mining operations lately introduced by Dr. M. H. Van Dyke in some of the western counties of North Carolina. * * * My observations on the hydraulic process were made during the month of April [1857] at the Jamestown mine, in McDowell County, North Carolina. The water was there conveyed * * * about 4 miles. The uniform descent was 4 inches to the hundred feet. * * * The number of hose pipes employed was 4. The mass of earth moved in 9 working days was 20 feet in depth, 82 in length, and 26 in breadth, being at the rate of 1,184 cubic feet, or 966 bushels, per day for each hose. * * * The labor employed * * * was that of 4 men and 2 boys. * * * The yield in gold was \$5.13 per day for each hose employed.

Shortly afterwards a further publication appeared in the same magazine,² from which the following extracts are taken:

The Wilkinson gold mine in Burke County, North Carolina, is owned by Dr. Van Dyke, and is worked by the hydraulic process. The water is brought * * * by a canal or aqueduct for a distance of 15 miles. * * * The water is not brought upon these mines at a very high head, only about 40 feet. There was only 1 pipe in operation at the time of my visit. The water passed through a 6-inch hose and a nozzle of 1½ inches. * * * The average yield of the mine * * * was about \$5 a day to each hand. * * * Obtaining a sample of the gold of this mine, we passed over about 2 miles to the Bunker Hill mine, also in Burke County. This was formerly known as the Brindletown mine. It is owned and worked by Rev. Benjamin Hamilton. * * * It is now worked by the hydraulic process. * * * The amount of water is limited, sufficient only for about 2 pipes, and is brought in a small ditch for a distance of 4 or 5 miles. * * * The Collins mine, in Rutherford County, is owned and worked by Dr. Van Dyke. The water is brought to this mine in a canal about 4 miles in length, at an elevation of 150 feet, and sufficient in amount for 20 pipes, and will command nearly 1,000 acres of surface. * * * Jamestown mine, McDowell County, North Carolina, is also worked by Dr. Van Dyke. The deposit workings embrace about 400 acres. The water is brought by a canal at an elevation of 70 feet and 5 miles in length. There is water enough here for 20 hose pipes.

Prof. William P. Blake (in 1858) in a "Report upon the gold placers of Lumpkin County, Georgia, and the practicability of working them by the hydraulic method with water from the Chestatee River,"³ says:

Desiring to see the results obtained [by Dr. M. H. Van Dyke] in North Carolina, and thus be enabled to form a better judgment of the probable results in Georgia, I first visited the placers in Burke and McDowell counties, where the [hydraulic] process is now in successful operation. * * * The average yield, as shown by the results of several of the North Carolina placers, is about \$6 a day to a pipe attended by 2 men, or by a man and a boy. At some of the placers the average is not less than \$10 a day. * * * At Brindletown, in the bed of a little brook which has a rapid descent, Mr. Hamilton has been washing very successfully with 2

¹ Vol. X, pp. 27-30. See also paper by Prof. William P. Blake, published in *Trans. Am. Inst. Mining Engineers*, October, 1895.

² Vol. X, pp. 393, 394, May, 1858.

³ *Mining and Statistic Magazine*, Vol. X, pp. 457-476, June, 1858.

pipes and 5 men and boys. * * * I am confident that the yield can not be less than \$20 a day, even among the former excavations where the gravel has been washed over more than once before.

Lieber¹ mentions the hydraulic process as being practiced previous to 1859, at Pilot Mountain, in Burke County, North Carolina, and he evidently has reference to the above-described localities.

The Dahlonga or Georgia method (a combination of hydraulicking, sluicing, and milling) originated in 1868.

The first record that we have of dredge mining is that carried on by a Mr. Gibson, in 1843-44, in the Catawba River, Gaston County, North Carolina. The river sediments and gravel were scooped out on flat-boats by men using long-handled scoops, and the material was carried ashore and washed.

Later on, mechanical dredges of various designs came into use, chiefly on the Chestatee River in Georgia.

The advent of the hydraulic gravel elevator dates from about 1883. It was first applied at Brindletown, North Carolina, and at Dahlonga, Georgia. The well-known type of this mechanism, the Hendy lift, was employed at the Cincinnati Consolidated Company's mines, in Dawson County, Georgia, in 1883. The plan was to divert the Etowah River and to suck up the gravel from the old channel. The Leroy-Stone method² was experimented with on the Chestatee River in 1883, but the results are not known. The Crandall hydraulic elevator,³ as used at the Chestatee mine, Georgia, in 1895, contains important improvements over other types of similar mechanisms.

Vein mining probably followed more or less closely on the exhaustion of the richer gravel deposits. The first account of vein mining is in 1825, at the Barringer mine, Montgomery County, North Carolina.⁴

In Virginia the veins of the Tellurium and the Vacluse mines were discovered in 1832, and in Georgia the Reynolds vein, lot No. 10, near Nacoochee, in White County, was discovered some time prior to 1834.

For a long time the output was confined to the free-milling brown ores near the surface, and the ore was raised by horse whim and hand windlass, or even by baskets carried upon the backs of the miners. At first the gold from the ores of the decomposed outcrops of the veins was extracted by washing in rockers. The following quotation from Prof. Elisha Mitchell's Report on the Geology of North Carolina (1827), is pertinent here:

The quartz is raised from the mine, broken to pieces, and those parts which are known to contain gold selected for washing. This part of the process is conducted in the same way as in Montgomery [County], except that the agitation is continued for a longer time, and that a small quantity of quicksilver is put into the rockers to collect the gold by forming an amalgam with it.

The most primitive method of milling the quartz was undoubtedly by crushing in hand mortars and subsequent panning. This is still

¹ Supplementary Report to the Survey of South Carolina, 1859, p. 154.

² Trans. Amer. Inst. Mining Engineers, Vol. VIII, p. 254.

³ Trans. Amer. Inst. Mining Engineers, Feb., 1896.

⁴ Now Stanly County.

carried on by the native tributors in certain districts. It was followed by the introduction of the drag mill (*arrastra*), the Chilean mill, and eventually the stamp mill. The two former were evidently drawn from South American and Mexican practice, and were probably the first mechanical pulverizing machinery used.

As an illustration of some of the earlier milling methods the following is taken from a report of the supervising committee of the United States Mining Company in 1835, on their mine near the Rappahannock River, Virginia:

The plant consists of a crushing (rolls) and a vertical mill (stamp mill) in a building 26 by 36 feet. Both mills are located on the ground floor and are propelled by a water wheel 11 feet in diameter, with an 11-foot face. The crushing mill has three sets of cylinders 2 feet in length and 15 inches in diameter, the first or upper set fluted, the other smooth. The ore is thrown into a hopper on the upper floor, from which it is conducted over an inclined shaking table to the fluted cylinders, by which it is crushed to a size from one-fourth to 1 inch in diameter. The crushed material is equally divided and goes to the two sets of smooth cylinders. By them it is further greatly reduced, ranging from impalpable powder to grains as large as coarse hominy. From these cylinders it falls into a sifter having the fineness and motion of the common meal sifter, from whence the material which passes through is conducted to 12 amalgamators, constructed upon the principle of the Tyrolese bowls, making from 90 to 100 revolutions per minute. They perform the office of washing and amalgamating. The sand discarded by them, after being washed, is conducted through troughs to the vertical mill, where, being reduced to an impalpable powder, it passes in the shape of turbid or muddy water to another set of amalgamators similar to those above mentioned, and thence to the river. The portion of the ore reduced by the cylinders which passes over the sifters is conducted to the vertical mill, and is treated in the same manner.

The process at another Virginia mine, the Vacluse, is described¹ in 1847, as follows:

The machinery consists of a condensing Cornish mining engine of 120 horsepower; the mill house contains 6 large Chilean mills; the cast-iron bedplate of each is 5 feet 6 inches in diameter, and on it are two cast-iron runners of the same diameter, the total weight of the mill being 6,200 pounds. The ores on arriving at the surface are divided into two classes: (1) The coarse and hard ore for the stamps; (2) slate and fine ore for the Chilean mills. This is done by means of a large screen. The very large flat pieces are first broken by a hammer before they are fed to the stamps. All of the ores are ground with water, each mill being supplied with hot and cold water at pleasure. Twelve inches from the top of the bedplate there is a wide, open mouth from which the turbid water escapes to tanks. On the south side of the steam engine is the stamp house and amalgamation mill containing 6 batteries of three stamps each; these stamps, with the iron head of 125 pounds, weigh 350 to 380 pounds each. Each battery is supplied with water, and at each blow of the stamp a portion of the fine ore passes out of the boxes through the grates to the amalgamation room. Here are stationed 18 small amalgamation bowls of cast iron, 30 inches in diameter. The bowls are supplied with runners which move horizontally; in the center of these runners is an eye or opening like that in the runner of a corn mill. The ground or finely stamped ore, gold, and water pass into this eye, and by the rotary motion of the same are brought into contact with the quicksilver deposited in the center, forming amalgam. From the amalgamators the pulp passes through three dollytubs or catchalls, acting as mercury and gold tubs. After this the whole

¹ Plan and description of the Vacluse mine, Orange County, Virginia, Philadelphia, 1847.

mass passes to the strakes or inclined planes where the sulphurets are deposited and the earthy matter washed away. These sulphurets were formerly treated in two heavy Mexican drags or arrastras, but not answering so good a purpose, they have been altered into three heavy Chilean mills.

The collection of amalgam, retorting, and melting was carried on practically in the same manner as to-day. The total plant at this mine was valued at \$70,000.

Emmons gives the method of working the ores of Gold Hill, North Carolina, in the earlier days, as follows:¹

The machinery employed at Gold Hill for separating gold consists, first, of the Chilean mill for crushing and grinding, after being broken by hammers, the Tyrolese bowls, the Burke rockers, and the drag mill. * * * The work for a Chilean mill of this ore is 70 bushels per day, and our mills run for twenty-four hours, with one or two short interruptions. They are all moved by steam power, and all the water used in the mills is pumped from the mine. The Burke rocker is the principal and best saving machine employed. The drag mill is also a good machine, is cheap, and easily kept in repair. On inspecting these operations when going on, it is impossible to resist the conclusion that much of the gold is wasted along with the mercury.

Emmons further states the force employed at Gold Hill at that time, for working the Earnhardt (Randolph) vein, to consist of "66 miners paid by the month, and 39 negroes hired by the year. The day of twenty-four hours is divided into 3 shifts of eight hours each for underground work."

The stamp mill, or, as it was originally called, the "pounding mill," was probably a European innovation, being well known in Europe before the discovery of America. As early as 1836 a 6-stamp mill, with 50-pound stamps, was in operation at the Tellurium mine in Virginia. In 1837 a Frenchman erected a mill at the Haile mine, in South Carolina. These primitive mills were constructed of wood, with iron shoes and die plates. The general type of construction was similar to that of the present California mills, with the exception that the stems were square and did not revolve, the cams working in slots or recesses cut into the stems. A few of these old-fashioned mills may still be seen in operation in Georgia, in the Nacoochee Valley, seemingly serving the purpose of the tributors and petty quartz miners, and it is stated that they are operated at a fair profit. They are cheaply constructed, a 10-stamp mill with water wheel and building complete costing about \$150. The amalgamation is done on a copper plate of the width of the battery and about 1 foot long.

The first regular California battery was erected at the King's Mountain mine, in North Carolina, just after the war; and in 1866 a similar mill was built at the Singleton mine, in Georgia, by Dr. Hamilton.

Besides mills of Western manufacture, there are two types which are common to the South. One of these is a 750-pound mill, built by the Mecklenberg Iron Works, of Charlotte, North Carolina, a slight variation of the Western type. The other is the 450-pound Hall mill, with

¹Geological Report of the Midland Counties of North Carolina. 1856. E. Emmons. pp 160 et seq.

hand feed, and is peculiarly adapted to the saprolitic ores of the Dahlonega district, in Georgia.

Various types of rotary pulverizers and pan amalgamators have been introduced in the South from time to time, supposedly as improvements on the stamp mill. Thus, for instance, the Howland mill, a flat circular disk, revolving in an iron shell, and similarly the Crawford (with revolving iron balls) and the Huntington mills; the Parson mill, not unlike the Howland, but covered with a hood, and having the interior grinding surfaces coated with lead amalgam; the Meech mill, in which the quicksilver was comminuted by superheated steam; the Wiswell mill, being practically an iron Chilean mill, fed with corrosive sublimate in connection with an electric current; the Nobles process, in which the ore was ground to 100 mesh between buhrstones, and the pulp run over amalgamated slabs of zinc or lead. Revolving Freiberg barrels were also used at some of the mines. The Blake system of fine crushing, combined with subsequent wet grinding,¹ was introduced at the Haile mine in 1884, but was soon abandoned in favor of the present stamp mill.

The above are simply cited as a few examples of the vast number of mechanical appliances for grinding and amalgamation with which the mines of the Southern States have been overrun. Although some of these, notably the Huntington mill, are still in use at a few places, it has been quite clearly demonstrated that such grinding apparatus produces float gold and flours the quicksilver, besides which the mechanism is subjected to great strain and wear, against all of which defects the stamp battery with plate amalgamation has proved itself vastly superior, and, through all of its vicissitudes, has held the field as the most economical and rational apparatus for milling and amalgamating gold ores.

As soon as the water level was reached in the mines and the free-milling brown ores were practically exhausted, attempts were made to treat the undecomposed sulphurets. Probably the earliest method employed for the concentration of these sulphurets was that used at the Vacluse mine in 1847 (described above), which consisted in passing the material over strakes or inclined planes. This was probably followed by buddles, primitive bumping tables, and more especially by blankets. Log rockers were also used at an early date for this purpose. At the present day the Frue, Embrey, and Triumph concentrators are in general use. Of these the Embrey machine is considered by some to give better results, especially where skilled labor can not be obtained and where the material is not sized. Still, each one of the three finds its strong advocates, and the difference in perfection of concentration obtained by them is probably not material. In some cases—as, for instance, in the Gold Hill district—the finely divided condition of the gold has led to the reemployment of blankets.

¹Trans. Amer. Inst. Mining Engineers, Vol. XVI, p. 755.

At the Reimer mine, North Carolina, a plant was in operation in 1883, in which the ore was comminuted in a series of crushers and 26-inch rolls; the pulp was sized into six grades, from 10 to 60 mesh, and each grade treated separately by a Bradford jig. This process is said to have given good results, but the plant was destroyed by fire soon after its erection and never rebuilt. The same system of jigging was at one time in use at the McGinn mine in North Carolina.

The earliest treatment of the concentrated sulphurets was by regrinding them (in the raw, unroasted state) in Mexican arrastras and Chilean mills, with subsequent amalgamation, as described above in the practice of working the ores at the Vaucluse mine, Virginia, in 1847.

In 1852-53 a Dr. Holland, of Massachusetts, introduced a roasting process at some mines near Charlotte, North Carolina, in which the pyritic concentrates were mixed with nitrate of potash or soda, and roasted in a reverberatory furnace at a low heat.

Lieber stated¹ in 1856 that a process for roasting sulphurets, with subsequent amalgamation, had been introduced by a Mr. C. Ringel at a mine near Rutherfordton, North Carolina, and was afterwards practiced with success on old tailings at the Gold Hill and other mines in North Carolina.

In the past history of the Southern mines a vast number of roasting processes and furnaces have been introduced, many of them passing to the ludicrous, but they have never lasted beyond the experimental stage, excepting as a preliminary to chlorination. Heap roasting with salt was also tried.

Some of the furnaces, particularly the well-known reverberatory type, were successful enough, so far as the roasting went; the fault lay in the prevalent and popular belief that, by oxidizing the sulphurets, the difficulty of amalgamating the precious metals which had been set free would be removed, when in fact the resulting coating of iron-oxide was nearly as fatal to the work as the sulphide had been.

The Bartlett method of making white lead-zinc oxide was introduced at the Silver Hill mine, North Carolina, in 1871-72. It consisted in roasting the concentrated galena-blende, and condensing the zinc-lead oxide fumes, which made a good paint material. The process is said to have been carried on successfully until all the available, suitable material was exhausted.

The next step was in the direction of a chemical treatment of the refractory sulphurets. It would be useless to outline the numerous processes that were experimented with for this purpose. The South has been, much to its detriment, the "proving ground" of almost all the patent gold-saving processes invented, and the greater proportion of these have, as might have been predicted, resulted in utter failure. Of all of these the chlorination process is, practically, the only survivor, and there is a possibility of the successful application of the cyanide process.

¹ Report on the Survey of South Carolina for 1856, p. 47.

It was not until 1879 that the successful treatment of pyritic sulphurets was accomplished, by the introduction of the chlorination process. In that year a Mears chlorination plant was erected at the Phoenix mine, North Carolina, under the management of Mr. A. Thies, who soon improved on and developed it into what is now universally known as the Thies process.

In 1880 a chlorination plant (the Davis and Tyson Metallurgical Works) was erected 2 miles south of Salisbury, North Carolina. The process used was known as the Davis process, which differed from the Mears only in the method of precipitating the gold with charcoal instead of ferrous sulphate. These works were in spasmodic operation, on custom ores, for several years.

In 1881 a Davis plant was erected at the Reimer mine, North Carolina.

In 1882 the Plattner chlorination process was introduced at the Tucker mine, North Carolina, but was not successful, and in the following year the Mears process was substituted, which also had but a short existence here. These failures were, however, most probably due to the impractical application of the methods rather than to the character of the methods themselves.

Experiments were made several years ago by Mr. P. G. Lidner at the Brewer mine, in South Carolina, and at Dahlonega, Georgia, with a chlorination process for treating the ore in bulk, and a plant for a patent electrolytic chlorination process was erected in 1895 at the Clopton mine, Villa Rica, Georgia. None of these has, however, met with practical success.

At the present time the Thies process is in successful operation at the Honeycut-Fritz (Isenhour) mine, North Carolina, the Haile mine, South Carolina, and at the Franklin and the Royal mines, Georgia.

The cyanide process has so far found but little application in the South. In May, 1892, Mr. Richard Eames, of Salisbury, North Carolina, experimented with cyanide at the Gold Hill mine, North Carolina, extracting 60 per cent of the assay value. In the summer of 1893 a 10-ton cyanide plant was working at the Moratock mine, North Carolina, but the operations were soon relinquished on account of the low grade and character of the ore. Later in the same year a cyanide plant was in operation at the Gilmer mines in Goochland County, Virginia, with what success could not be ascertained. At the Franklin mine, Georgia, a treatment of the ores with cyanide was attempted before the introduction of the chlorination process. It proved successful on the oxidized tailings from the old dumps, but the extraction from the fresh sulphurets was insufficient to warrant its continuation.

In 1895 cyanide experiments were made at the Sawyer mine, in Randolph County, North Carolina, but were soon abandoned. In 1896 a 30-ton cyanide plant was erected at the Russell mine, North Carolina, by the American Cyanide Gold and Silver Recovery Company, of Denver, Colorado, and a small plant was also built at the Cabin Creek

mine, North Carolina, by the same company, but neither of these was ever put in practical operation.

The Hunt and Douglas process was successfully applied in 1880 to the ores of the Conrad Hill mine, North Carolina. The roasted sulphurets were leached with a ferrous chloride solution, converting the copper to a soluble chloride, from which it was precipitated as metallic cement on scrap iron.

The Designolle process, which consisted in treating the roasted ore with corrosive sublimate in iron vessels, was only moderately successful in its application, for the reason that it made a very base bullion, the iron of the apparatus invariably precipitating any soluble salts formed in the roasting. It was worked for a time, during 1882-83, at a custom plant near Charlotte, North Carolina; at the New Discovery mine, Rowan County, North Carolina (1883), and at the Haile mine,¹ South Carolina (1883).

A plant for the extraction of gold from pyritic concentrates, with the recovery of the sulphuric acid, was erected early in the present decade at Blacksburg, South Carolina, mainly for the treatment of custom ores. The concentrates were roasted in a Walker-Carter muffle furnace, which was connected with lead chambers. The amalgamation of the roasted product was carried on by a patent process known as the Caloric Reduction Company's process, the principle of which was a volatilization of mercury into the mass of the pulp, followed by a condensation of the same, the amalgam being led into settling vats. It was proposed to use the tailing residues for the manufacture of paint. The scheme, as might have been predicted, was a failure.

A similar process, known as the Phelps process, had already been unsuccessfully tried on North Carolina ores in (about) 1877, in an experimental plant situated at Philadelphia.

Attempts at pyritic smelting were made as early as 1847 at the old Vacluse mine, in Virginia, by Commodore Stockton, but resulted in failure.

Matte smelting, with subsequent refining in reverberatory furnaces, was practiced (about 1881-82) on the copper ores of the Conrad Hill and the North State mines, in North Carolina.

Experiments on matting auriferous sulphurets from the Haile mine, in South Carolina, were made in 1886, by Mr. E. G. Spilsbury,² but proved unsuccessful.

Regarding smelting processes in the South, probably most has been done in the attempted treatment of the complex galena-blende ores, carrying gold and silver, of the Silver Hill and the Silver Valley mines, Davidson County, North Carolina. The process in use at Silver Hill, as early as 1853, was heap roasting, followed by wet-crushing in stamp battery, the zinc oxide being dissolved and recovered separately, after which the residues were smelted in the old-fashioned Scotch open-

¹ Trans. Amer. Inst. Mining Engineers, Vol. XV, p. 771.

² Id., pp. 767-775.

hearth lead furnace, and the precious metals were recovered from the pig lead by refining in a cupellation furnace.

During the last twelve years a number of patent processes have been experimentally tried on the Silver Valley ores in a plant situated at Thomasville, North Carolina, but it was not until 1895 that a successful process was introduced by Mr. Nininger, of Newark, New Jersey. It consists of a down-draft jacket furnace, through which the fumes of lead and zinc are carried downward into condensers, where they are met by a spray of water, the liquor being led to vats where lead oxide is deposited, while the zinc remains in solution, and is subsequently precipitated as zinc oxide. The matte, carrying copper, gold, and most of the silver, is tapped from the well of the furnace, and cast into pigs.

MANGANESE ORES.

By JOHN BIRKINBINE.

PRODUCTION OF MANGANESE ORES.

The decided increase in the production of steel in 1898 resulted in an augmented demand for manganese ores, the principal market for which is in the production of ferro-manganese at steel works. These ores are also used by chemical works in relatively small quantities.

Usually, an increased demand for manganese is met by increased imports of ore, the home production also augmenting, but not in proportion to that of the foreign ores imported. The war with Spain, however, had the effect of diminishing importations, and the home production in the year 1898 amounted to 15,957 long tons, valued at \$129,185, or \$8.10 per ton. This was an increase of 4,849 long tons, or 43.7 per cent, over the 1897 output of 11,108 long tons. It is the largest production of manganese ore reported since the year 1891.

Six States contributed to the total, as compared with seven in 1897. The States of Michigan and Pennsylvania in 1898 do not appear in the list as producers of manganese ore, although they have both mined manganiferous iron ores, but Alabama supplied a trial shipment, the first for a number of years. Georgia heads the list of States with a total of 6,689 long tons, followed by Virginia and Arkansas.

Notwithstanding the great and varied mineral resources of the United States, the domestic manganese mines now developed are unable to supply the demand; for most of the known deposits in this country are unreliable as to extent or undesirable in composition of the ores. The decreased price paid for manganese ore whose quality is below the limit set by the steel works, especially as regards the phosphorus contents, materially influences the exploitation of some deposits.

The production and value at the mine of manganese ores by States in 1898, 1897, and 1896 are as follows, the latter years being offered for the purpose of comparison:

Amount and value of manganese ores produced in the United States in 1896, 1897, and 1898

State.	1896.			1897.			1898.		
	Prod. uct.	Total value.	Average value per ton.	Prod. uct.	Total value.	Average value per ton.	Prod. uct.	Total value.	Average value per ton.
	<i>Long tons.</i>			<i>Long tons.</i>			<i>Long tons.</i>		
Alabama							22	^a \$143	^a \$6.50
Arkansas	3,421	\$36,086	\$10.72	3,240	\$33,708	\$10.40	2,662	26,035	9.78
California	284	3,415	12.02	484	2,788	5.76	541	3,222	5.96
Georgia	4,085	27,032	6.62	3,332	22,084	6.63	6,689	41,571	6.21
Michigan				87	370	10.00			
North Carolina	2	17	8.50						
Pennsylvania	285	1,988	7.50	354	2,832	8.00			
Tennessee	None.	None.		11	93	8.45	381	2,276	5.97
Virginia	2,018	21,485	10.65	3,650	33,630	9.21	5,662	55,939	9.88
West Virginia	13	104	8.00	None.	None.	None.			
Total	10,088	90,727	8.99	11,108	95,505	8.60	15,957	129,185	8.10

^a Estimated.

In the three years there has been a continued increase in production but a decline in average value at the mines.

The table given below will show the production of manganese ores in the three principal States, the total for the United States, and the total value from 1880 to 1898, inclusive.

From this it will be seen that until recent years Virginia held first rank, losing that position in 1894, but regaining it in 1897 and taking second rank in 1898. The leading position of this State was due to the Crimora mine. When this deposit became practically exhausted, it caused a decided falling off in the total.

Arkansas and Georgia have good deposits of manganese ores, but the ore has to withstand heavier freight charges to points of consumption than the Virginia ore.

MANGANESE ORES.

127

Production of manganese ores in the United States from 1880 to 1898.

[Maxima are given in italics.]

Year.	Virginia.	Arkansas.	Georgia.	Other States.	Total.	Total value.
	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	
1880.....	3,661	.....	1,800	300	5,761	\$86,415
1881.....	3,295	100	1,200	300	4,895	73,425
1882.....	2,982	175	1,000	375	4,532	67,980
1883.....	5,355	400	.....	400	6,155	92,325
1884.....	8,980	800	.....	400	10,180	122,160
1885.....	18,745	1,483	2,580	450	23,258	190,281
1886.....	<i>20,567</i>	3,316	6,041	269	30,193	277,636
1887.....	19,835	5,651	<i>9,024</i>	14	<i>34,524</i>	<i>333,844</i>
1888.....	17,646	4,312	5,568	1,672	29,198	279,571
1889.....	14,616	2,528	5,208	1,845	24,197	240,559
1890.....	12,699	5,339	749	<i>6,897</i>	25,684	219,050
1891.....	16,248	1,650	3,575	1,943	23,416	239,129
1892.....	6,079	<i>6,708</i>	826	.....	13,613	129,586
1893.....	4,092	2,020	724	882	7,718	66,614
1894.....	1,797	1,934	1,277	1,300	6,308	53,635
1895.....	1,715	2,991	3,856	985	9,547	71,769
1896.....	2,018	3,421	4,085	564	10,088	90,727
1897.....	3,650	3,240	3,332	886	11,108	95,505
1898.....	5,662	2,662	6,689	944	15,957	129,185
Total.	169,642	48,730	57,534	20,426	296,332	2,859,396

The record that in nineteen years the United States has supplied a total of less than 300,000 long tons of what may be properly classed as manganese ores, and that the greatest annual production was below 35,000 tons may be disappointing to some who have optimistic ideas of the magnitude of the domestic mining industry of manganese ores.

This statement is not intended to apply to ores which, while classed as manganiferous, do not contain sufficient manganese to include them in the foregoing tables. Such ores next demand attention.

PRODUCTION OF MANGANIFEROUS IRON ORES.

As in previous reports, the amounts of manganiferous iron ores mined in the year 1898 are included in the report on iron ores; but the production and value are also stated in this report. Some of the Colorado ores are used in the manufacture of spiegeleisen, but a large portion of those obtained in this State contain silver, and are utilized as a flux by the smelters.

In the Lake Superior region some of the iron ores carry relatively small percentages of manganese, but are marketed as iron ores, the manganese content having but a slight effect on the value of the ore.

The quantities of ores mined in 1898, containing enough manganese to have them reported as manganiferous, and the range of average percentages of manganese carried by these ores, are as below:

Production of manganiferous iron ores in 1898.

Locality.	Quantity.	Manganese.	Average value per ton at mine.	Total value.
	<i>Long tons.</i>	<i>Per cent.</i>		
Colorado	18,848	18 to 33	\$3.28	\$61,785
Lake Superior region	268,862	5 to 7	1.37	367,417
Pennsylvania	100	25	1.00	100
Total	287,810	5 to 33	1.49	429,302

The total production, the value of the ore at the mines, and the average price per ton of manganiferous iron ores in the United States from 1889 to 1898 has been reported as follows:

Total production of manganiferous iron ores in the United States from 1889 to 1898.

[Maxima in italics.]

Year.	Total product.	Total value.	Average value per ton.
	<i>Long tons.</i>		
1889	83,434	\$271,680	\$3.26
1890	61,863	231,655	3.74
1891	132,511	314,099	2.37
1892	153,373	354,664	2.31
1893	117,782	283,228	2.40
1894	205,488	408,597	1.99
1895	125,720	233,998	1.86
1896	338,713	726,413	2.14
1897	202,304	343,784	1.70
1898	287,810	429,302	1.49

PRODUCTION OF MANGANIFEROUS SILVER ORES.

In the mining of precious metals a considerable amount of manganiferous and argentiferous iron ore is obtained, which is used principally as a flux in the smelters, and is classed as iron ore, being included in the iron ore report of 1898. The quantities of these ores reported, their total values at the mines, and the average value per ton for the past decade are given below for comparison:

MANGANESE ORES.

129

Production of manganiferous silver ores in the United States from 1889 to 1898.

[Maxima in italics.]

Year.	Quantity.	Value.	Average value per ton.
	<i>Long tons.</i>		
1889.....	64,987	\$227,455	\$3.50
1890.....	51,840	181,440	3.50
1891.....	79,511	397,555	5.00
1892.....	62,309	323,794	5.20
1893.....	<i>a</i> 55,962	258,695	4.75
1894.....	<i>b</i> 31,687	148,292	4.84
1895.....	54,163	229,651	4.24
1896.....	138,079	416,020	3.01
1897.....	<i>149,502</i>	<i>424,151</i>	2.84
1898.....	99,651	295,412	2.96

a Including 1,500 tons from Montana, for which no value is given.

b Including 1,049 tons from Montana, for which no value is given.

PRODUCTION OF MANGANIFEROUS ZINC RESIDUUM.

In the northern part of New Jersey large quantities of zinc ores are mined, and in the smelting of these ores considerable amounts of zinc residuum (a clinker carrying iron and manganese and some zinc) are obtained. This residuum is utilized in the manufacture of spiegeleisen, and the yearly production from 1889 to 1898, inclusive, together with the total value and the average value per ton, are given in the table below:

Production of manganiferous zinc ore residuum in the United States from 1889 to 1898.

[Maxima in italics.]

Year.	Quantity.	Value.	Average value per ton.
	<i>Long tons.</i>		
1889.....	43,648	\$54,560	\$1.25
1890.....	<i>48,560</i>	<i>60,700</i>	1.25
1891.....	38,228	57,432	1.50
1892.....	31,859	25,937	.81
1893.....	37,512	30,535	.81
1894.....	26,981	20,464	.76
1895.....	43,249	24,451	.57
1896.....	44,953	20,455	.46
1897.....	33,924	18,713	.55
1898.....	48,502	<i>a</i> 26,676	<i>a</i> .55

20 GEOL, PT 6—9

a Estimated.

PRODUCTION AND VALUE OF MANGANESE AND MANGANIFEROUS ORES REPORTED IN 1898.

To give an idea of the production of ores containing manganese in sufficient quantities to be considered as being related to this metal, the following table, giving the quantities of the various classifications heretofore mentioned as being mined in 1898, is presented.

Production of manganese and manganiferous ores in the United States, in 1898.

Kind of ore.	Quantity.	Value.	Average value per ton.
	<i>Long tons.</i>		
Manganese ore	15,957	\$129,185	\$8.10
Manganiferous iron ore	287,810	429,302	1.49
Manganiferous silver ore	99,651	295,412	2.96
Manganiferous zinc ores	48,502	<i>a</i> 26,676	<i>a</i> .55
Total	451,920	830,575	<i>b</i> 1.95

a Estimated. *b* Average.

Having discussed the manganese ore industry of the United States as a whole, and that of the manganiferous iron, silver, and zinc ores, the record of producing States will be considered in alphabetical order.

PRODUCTION OF MANGANESE IN VARIOUS STATES.

ALABAMA.

Alabama produced a small amount of manganese in 1898, but the shipment of 22 tons is to be considered as a trial rather than the result of regular exploitation.

ARKANSAS.

Manganese ores occur in two sections of Arkansas. The producing region known as the "Batesville" district lies in the northern central portion of the State, principally in Independence and Izard counties. The other district, which is not at present exploited, is in the southwestern part of the State, and is claimed to extend from Pulaski County into Polk County on the west. Two principal varieties of manganese ore occur in the Batesville region, viz, massive, psilomelane; the other, crystalline, mostly braunite. There are also gradations between the two, and smaller quantities of pyrolusite and wad are also found. The better class of Batesville ore contains 50 per cent of manganese, and the low-grade ores run from 40 per cent down to and in some cases less than 25 per cent of manganese. The ores mined are principally used in the manufacture of ferro-manganese and spiegeleisen.

The following shows the production of manganese ore in the Batesville district to December 31, 1898, indicating that a total of 49,300 tons has been contributed from 1850 to 1898, inclusive.

MANGANESE ORES.

131

Production of manganese in the Batesville district of Arkansas to December 31, 1898.

Year.	Authority.	Quantity.
		<i>Long tons.</i>
1850 to 1867	Estimated	400
1868	do	10
1881	Railroad reports of shipments	100
1882	do	175
1883	do	400
1884	do	800
1885	Mineral Resources of the United States ..	1,483
1886	do	3,316
1887	do	5,651
1888	do	4,312
1889	Eleventh Census	2,528
1890	Mineral Resources of the United States ..	5,339
1891	do	1,650
1892	do	6,708
1893	do	2,180
1894	do	1,934
1895	do	2,991
1896	do	3,421
1897	do	3,240
1898	do	2,662
Total		49,300

CALIFORNIA.

Although manganese ores are reported as occurring in seven counties in this State, the deposits in Alameda County only are active, and the table below will show the annual output for the period from 1874 to 1898, inclusive, reached an aggregate of but 9,656 tons, including an estimate of the yield prior to 1889.

Total production of manganese ores in California to December 31, 1898.

Year.	Quantity.	Year.	Quantity.
	<i>Long tons.</i>		<i>Long tons.</i>
1874 to 1888	6,000	1895	525
1889	53	1896	284
1890	386	1897	484
1891	705	1898	541
1892		Total	9,656
1893	400		
1894	278		

COLORADO.

In the report for 1896 a number of analyses were given of the different manganiferous iron ores and manganiferous silver ores of Colorado. The greater portion, and in some years the entire amount, of these ores produced come from the Leadville district in Lake County, being obtained in mining silver ores. Mr. Karl Sternberg, of New York, also states that there are large undeveloped deposits of manganiferous ores in Eagle County. As these ores are mined in connection with the silver operations, and they constantly vary in the amounts of manganese carried, no attempt has been made in later reports to separate the ores yielding 20 per cent or over of manganese from those having a lower content of this ingredient. As stated heretofore, these ores, except those used for the manufacture of spiegeleisen or ferro-manganese, are considered as iron ores and included in the iron-ore report, but they are also given below for the years 1889 to 1898, inclusive.

Production of manganiferous ores in Colorado from 1889 to 1898.

	1889.	1890.	1891.	1892.	1893.
	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>
Manganiferous iron ores used for producing spiegeleisen	2,075	.....	964	3,100	5,766
Manganiferous silver ores	64,987	51,840	79,511	62,309	54,462
Total	67,062	51,840	80,475	65,409	60,228

	1894.	1895.	1896.	1897.	1898.
	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>
Manganiferous iron ores used for producing spiegeleisen	7,022	13,464	9,072	16,519	18,848
Manganiferous silver ores	30,187	53,506	137,597	149,502	99,651
Total	37,209	66,970	146,669	166,021	118,499

GEORGIA.

Georgia supplied 6,689 long tons in 1898, slightly more than doubling the 1897 output of manganese ores (3,332 tons). This is due to increased exploitation in the Cartersville region.

The production from 1866 to 1898, inclusive, is given below. It represents an aggregate of 77,484 tons, including estimates for the earlier years.

MANGANESE ORES.

133

Production of manganese ores in Georgia from 1866 to 1898, inclusive.

Year.	Quantity.	Year.	Quantity.
	<i>Long tons.</i>		<i>Long tons.</i>
1866.....	550	1883 and 1884.....	(a)
1867.....		1885.....	2,580
1868.....		1886.....	6,041
1869.....		1887.....	9,024
1870.....	5,000	1888.....	5,568
1871.....		1889.....	5,208
1872.....		1890.....	749
1873.....		1891.....	3,575
1874.....	2,400	1892.....	828
1875.....	2,400	1893.....	724
1876.....	2,400	1894.....	1,277
1877.....	2,400	1895.....	3,856
1878.....	2,400	1896.....	4,085
1879.....	2,400	1897.....	3,332
1880.....	1,800	1898.....	6,689
1881.....	1,200	Total	77,484
1882.....	1,000		

a None reported.

LAKE SUPERIOR REGION.

The Lake Superior region occasionally produces ores which may be classified as manganese ores, but the iron ores obtained from some of the mines contain small percentages of manganese, not in sufficient amount, however, to materially enhance their value or effect their utilization to any extent.

The following analyses of ores dried at 212° F. will give an idea of the composition of some Lake Superior manganiferous iron ores:

Analyses of Lake Superior manganiferous iron ores.

Constituent.	No. 1.	No. 2.	No. 3.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Phosphorus	0.059	0.04	0.071
Silica	3.22	3.30	3.20
Manganese	4.50	7.40	5.75
Iron.....	58.21	55.70	56.80
Alumina	0.80	0.98	0.98
Lime	0.27	0.30	0.24
Magnesia.....	0.14	0.07	0.18
Sulphur	None.	0.016	0.10

The table below indicates the production of this class of ore in the years 1886 to 1898, inclusive, together with the average percentage of manganese reported.

Production of manganiferous iron ores in the Lake Superior region from 1886 to 1898.

Year.	Product.	Average per cent of manganese.	Year.	Product.	Average per cent of manganese.
	<i>Tons.</i>			<i>Tons.</i>	
1886.....	100,000	2		50,763	3.07
	157,000	4		57,872	3.55
Total ..	257,000		1894.....	6,264	6.50
				61,817	7.26
1887.....	200,000	4		14,610	7.75
	10,000	10		7,140	18
Total ..	210,000		Total ..	198,466	
1888.....	189,574	4		13,752	8
	11,562	11		10,228	7.608
Total ..	201,136		1895.....	10,000	7.5
				26,500	7.26
1889.....	50,018	6.74		51,785	3.536
	31,341	9+	Total ..	112,265	
Total ..	81,359				
1890.....	61,863			69,139	7.44
				47,000	5.75
	13,711	4.68 to 17.96	1896.....	18,900	5
	11,015	10		104,156	4.3
1891.....	9,213	9.68		38,590	3.22
	98,572	5.38		51,855	3.1
Total ..	132,511		Total ..	329,640	
	6,710	4.893		18,000	4
1892.....	102,695	5		38,489	5.85
	7,500	8	1897.....	92,872	6.99
	8,272	9.998		30,500	7.57
	22,254	12.028		35	14.5
Total ..	147,431			4,689	(a)
			Total ..	184,585	
	27,353	4.67		80,363	5 to 7
1893.....	55,009	7.61	1898.....	35,000	6.8
	15,102	7.77		153,499	6
	5,051	10.40	Total ..	268,862	
	7,833	14			
	300	22			
Total ..	110,648				

a Not given.

PENNSYLVANIA.

Pennsylvania did not produce any true manganese ore in the year 1898, but 100 tons of manganiferous iron ore carrying 25 per cent of manganese was mined.

Amount of manganese ores produced in Pennsylvania from 1894 to 1897.

Year.	Production.	Value.
	<i>Tons.</i>	
1894.....	35	
1895.....	460	\$2,300
1896.....	265	1,988
1897.....	354	2,832

TENNESSEE.

This State has been an intermittent producer, and in the year 1898 contributed 381 tons of manganese ore to the total for the United States. The mine from which most of this class of ore was obtained has, however, been reported as abandoned.

VIRGINIA.

As heretofore stated, this State was for years the principal producer of manganese ore in the United States, but after the practical exhaustion of the Crimora mine it fell to second place. In the years 1897 and 1898 there was considerable active exploitation, and the production was augmented, the amount contributed in 1898 reaching 5,662 long tons. Being nearer the points of consumption, the ores now represent augmented value, the average price at the mine being \$9.88 per ton.

In the report for 1897 a description of the occurrence of manganese ores in Virginia is given, and the production from 1880 to 1898 will be found below. The total amount mined in the last nineteen years was 169,642 long tons.

Production of manganese ores and manganiferous iron ores in Virginia from 1880 to 1898.

Year.	Manga- nese ores.	Manganif- erous iron ores.	Year.	Manga- nese ores.	Manganif- erous iron ores.
	<i>Tons.</i>	<i>Tons.</i>		<i>Tons.</i>	<i>Tons.</i>
1880.....	3,661		1890.....	12,699	
1881.....	3,295		1891.....	16,248	
1882.....	2,982		1892.....	6,079	2,842
1883.....	5,355		1893.....	4,092	1,188
1884.....	8,980		1894.....	1,797	132
1885.....	18,745		1895.....	1,715	
1886.....	20,567		1896.....	2,018	
1887.....	19,835		1897.....	3,650	
1888.....	17,646		1898.....	5,662	
1889.....	14,616		Total.....	169,642	

IMPORTS.

The United States continues to be dependent upon foreign supplies for the greater portion of manganese ores consumed. The total amount imported during the year 1898 was 114,885 long tons, valued at \$831,967, or \$7.24 per ton, a falling off from the previous year of 5,076 tons, or 4.23 per cent. The principal contributor was Russia, which supplied over 40 per cent of the total, followed by Brazil, Turkey in Europe, and Chile. The high valuation placed on the ores from Germany, Scotland, and Nova Scotia is probably due to other chemical constituents than manganese.

The following figures, supplied by the Bureau of Statistics of the United States Treasury Department, indicates the amount of manganese ore imported in 1898 by countries, with their reported values:

Manganese ores imported into the United States during the calendar year 1898, by countries.

Country.	Quantity.	Value.
	<i>Long tons.</i>	
Russia on the Black Sea	46,396	\$292,768
Brazil	17,031	172,129
Turkey in Europe	13,890	91,085
Chile	12,268	68,154
Colombia	9,100	80,108
Japan	7,041	48,784
British East Indies	5,944	26,034
Cuba	1,600	8,026
Germany	768	27,493
England	301	4,827
Dutch West Indies	226	2,265
Scotland	150	7,842
Mexico	58	805
Nova Scotia	22	660
France	1	15
Other countries	89	972
Total	114,885	831,967

MANGANESE ORES.

137

Relative quantities and values of domestic and imported manganese ores from 1889 to 1898.

Year.	Domestic production.		Foreign imports.	
	Quantity.	Value.	Quantity.	Value.
	<i>Long tons.</i>		<i>Long tons.</i>	
1889.....	24, 197	\$240, 559	4, 286	\$78, 391
1890.....	25, 684	219, 060	34, 154	516, 900
1891.....	23, 416	239, 129	28, 825	380, 618
1892.....	13, 613	129, 586	58, 572	840, 811
1893.....	7, 718	66, 614	68, 113	880, 238
1894.....	6, 308	53, 635	44, 655	432, 561
1895.....	9, 547	71, 769	86, 111	747, 910
1896.....	10, 088	90, 727	31, 489	250, 468
1897.....	11, 108	95, 505	119, 961	1, 023, 824
1898.....	15, 957	129, 183	114, 885	831, 967
Total for 10 years ..	147, 636	1, 335, 759	591, 051	5, 983, 688
Average for 10 years.	14, 764	133, 576	59, 105	598, 369

The figures indicate that in the past decade the United States has produced one-fifth of the manganese ores consumed, but that in 1898 the proportion of domestic ores was one-eighth of the total apparent consumption.

No manganese ores are exported as such.

The importation of manganese ore by customs districts shows that Philadelphia remains the principal port of entry, followed in order by Baltimore and New York. This is shown in the table below:

Manganese ore imported into the United States during the calendar year 1898, by customs districts.

Customs district.	Quantity.	Value.
	<i>Long tons.</i>	
Philadelphia, Pennsylvania	69, 213	\$473, 575
Baltimore, Maryland	35, 623	254, 289
New York, New York.....	9, 906	97, 927
Pittsburg, Pennsylvania.....	63	4, 523
Corpus Christi, Texas.....	58	805
Newport News, Virginia.....	11	441
Boston and Charlestown, Massachusetts.....	2	67
Other districts	7	340
Total	114, 885	831, 967

For the sake of comparison the following tables are presented to show the quantities and values of manganese ores imported into the United States from 1889 to 1898, inclusive:

Manganese ore imported and entered for consumption into the United States from 1889 to 1898.

Year.	Quantity.	Value.	Year.	Quantity.	Value.
	<i>Long tons.</i>			<i>Long tons.</i>	
1889.....	4, 286	\$78, 391	1894.....	44, 655	\$432, 561
1890.....	34, 154	516, 900	1895.....	86, 111	747, 910
1891.....	28, 825	380, 618	1896.....	31, 489	250, 468
1892.....	58, 572	840, 811	1897.....	119, 961	1, 023, 824
1893.....	68, 113	880, 238	1898.....	114, 885	831, 967

PRODUCTION OF MANGANESE IN FOREIGN COUNTRIES.

CANADA.

All of the manganese ore mined in Canada is obtained from New Brunswick and Nova Scotia. The data showing the annual production and value, as well as the exports of manganese ore, were supplied by Mr. George M. Dawson, director of the Geological Survey of Canada. The increase in the value of the ore since 1892 is probably due to the reopening of the Tennycap mines, from which ores of high grade are obtained. The annual production of manganese ore in Canada, the total value and the value per ton from 1886 to 1898, inclusive, has been as follows:

Production of manganese ore in Canada from 1886 to 1898.

Year.	Production.	Value.	Value per ton.
	<i>Short tons.</i>		
1886.....	1, 789	\$41, 499	\$23. 20
1887.....	1, 245	43, 658	35. 07
1888.....	1, 801	47, 944	26. 62
1889.....	1, 455	32, 737	22. 50
1890.....	1, 328	32, 550	24. 51
1891.....	255	6, 694	26. 25
1892.....	115	10, 250	89. 13
1893.....	213	14, 578	68. 44
1894.....	74	4, 180	56. 49
1895.....	125	8, 464	67. 71
1896 ^a	123½	3, 975	32. 19
1897 ^a	15½	1, 166	76. 46
1898.....	50	1, 600	32. 00

^a Exports.

Mr. Edwin Gilpin, M. E., Inspector of Mines of Nova Scotia, reports that during the year ending September 30, 1898, 75 long tons of manganese ore were mined in that province.

The exports of manganese ores, from 1873 to 1897, inclusive, from Nova Scotia and New Brunswick are given below:

Exports of manganese ore from Canada 1873 to 1897, inclusive.

Year.	Nova Scotia.		New Brunswick.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	<i>Short tons.</i>		<i>Short tons.</i>		<i>Short tons.</i>	
1873.....			1,031	\$20,192	1,031	\$20,192
1874.....	6	\$12	776	16,961	782	16,973
1875.....		200	194	5,314	203	5,514
1876.....	21	723	391	7,316	412	8,039
1877.....	106	3,699	785	12,210	891	15,909
1878.....	106	4,889	520	5,971	626	10,860
1879.....	154	7,420	1,732	20,016	1,886	27,436
1880.....	79	3,090	2,100	31,707	2,179	34,797
1881.....	200	18,022	1,504	22,532	1,704	40,554
1882.....	123	11,520	771	14,227	894	25,747
1883.....	313	8,635	1,013	16,708	1,326	25,343
1884.....	134	1,054	469	9,035	603	20,089
1885.....	77	5,054	1,607	29,695	1,684	34,649
1886.....	a 441	854	1,377	27,484	a 1,818	58,338
1887.....	578	14,240	837	20,562	1,415	34,802
1888.....	87	5,759	1,094	16,073	1,181	21,832
1889.....	59	3,024	1,377	26,326	1,436	29,350
1890.....	177	2,583	1,729	34,248	1,906	36,831
1891.....	22	563	233	6,131	255	6,694
1892.....	84	6,180	59	2,025	143	8,205
1893.....	123	12,409	10	112	133	12,521
1894.....	11	720	45	2,400	56	3,120
1895.....	108	6,348	17	3	108 1/2	6,351
1896.....	123 1/2	3,975			123 1/2	3,975
1897.....	15 1/2	1,166			15 1/2	1,166

a The 250 tons from Cornwallis should be more correctly classed under the heading of mineral pigments.

WEST INDIES.

CUBA.

The late war with Spain interfered with mining operations in Cuba, but with the suspension of hostilities operations were resumed and 950 tons of manganese ore mined in 1898.

Manganese is found in several localities. The principal exploited deposits are those of the Ponupo Manganese Company, about 24 miles

west of Santiago. A number of samples of ore from these mines gave the following analyses:

Analyses of manganese ore from Santiago, Cuba.

No. of sample.	Title.	Manganese.	Phosphorus.	Iron.	Silica.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
1	Vencedora, north side.....	49.19	0.062	2.42	2.72
2	.....do	51.91	.049	.79	1.09
3	.....do	50.51	.057	.52	1.33
4	Vencedora, big pit.....	51.79	.063	.99	1.30
5	Vencedora, pit back of kitchen ..	51.12	.033	.98	1.17
6	Sultana, top of bank.....	51.36	.070	.79	1.22
7	Sultana, river bank.....	44.63	.038	1.77	6.11
8	Volcanis	48.22	.063	4.39	3.00

The annexed table will show the amounts of manganese ore produced by the Santiago district from 1888 to 1898, inclusive.

Exports of manganese ore from Santiago district, Cuba, from 1888 to 1898.

Year.	Quantity.
	<i>Tons.</i>
1888.....	1,942
1889.....	704
1890.....	21,810
1891.....	21,987
1892.....	18,751
1893.....	10,640
1895.....	1,394
1896.....	None.
1897.....	None.
1898.....	950

The amount of manganese ore exported from Cuba according to United States import statistics was 1,600 tons in 1898. The Government figures, however, refer to the ports from which the vessels last cleared, and the difference is accounted for by vessels which started from Nombre de Dios, Colombia, with manganese ores and made up the balance of their cargo from iron ores obtained at Santiago, Cuba.

SOUTH AMERICA.

BRAZIL.

Prof. Orville A. Derby, of Sao Paulo, Brazil, has supplied the following optimistic information concerning the operations of the two firms at present mining manganese ore in that country:

Ariosa & Co.—Goncalves Ramos mine near Miguel, Burnier Station, kilometer 503 (Onis Puto branch), of Brazil Central Railroad. The

principal gallery is 150 meters long, excavated on the lode, timbered with Decanville track, and with a secondary gallery of 35 meters for ventilation and discharge of ore. The ore is excavated in secondary galleries, giving five working faces, the working being refilled with earth from below upward.

The lode is nearly vertical and has been traced for about $1\frac{1}{2}$ kilometers, with a width of 1.1 meters to 3 meters (mean 2 meters). Exploration has been carried to a depth of 80 meters, the ore continuing beyond that depth. The quality is quite uniform, between 48 and 51 per cent of manganese, without silica or phosphorus. The ore body is calculated to contain 400,000 tons, of which only the portion above the level of the railroad and to the left of the line, calculated at over 120,000 tons, is at present worked. The actual output is 60 tons per day, which can be increased to 100 tons by works in progress, and to 120 tons by works projected. The firm, established in 1896, holds various properties along a line 100 kilometers long, and is actually working at the following points:

Rodiga Silva, near station of same name on Onis Puto branch, is worked in two open cuttings, giving a 50 per cent ore, containing some silica and phosphorus.

Miguel Burnier, at kilometers 498 to 504 of the trunk line, has three mines; one of which is that of Goncalves Ramos, above described, the others are Ariosa with two galleries of 180 meters and three open cuts, and the Scheele mine with shaft and gallery and open cut.

Bocanio, near kilometer 492 of the trunk line and 4 kilometers distant from railroad, is not yet developed. Four lodes are recognized, giving 52 per cent ore with some silica but no phosphorus.

Pefuiry, with a narrow gauge (60 centimeters) private line of rail, 13 kilometers long is not fully developed. A mass of ore 70 meters high, 20 meters thick and about 2,000 meters long has a recognized composition of 50 to 55 per cent manganese without silica or phosphorus.

Barrozo, at kilometer 454 of trunk line, is open cut and has a gallery of 76 meters. It yields 45 per cent ore with a little silica and phosphorus.

Jacuba, in front of Barroza is an open cut, with 45 to 50 per cent ore.

The firm took out in 1897, 7,000 to 8,000 tons; in 1898, 13,900 tons; and expect in 1899 to take out 30,000 tons. After 1900 a monthly output of 5,000 tons is expected.

Costa & Almeida.—Situated at Miguel Burnier, on Brazil Central Railroad. The lode worked is supposed to be the same as that of the Goncalves Ramos mine of Ariosa & Co. Dip of lode, 60° to 90° ; mean width, 2 meters; depth already verified, 90 meters; 400 laborers employed; worked as open cut, but preparations for underground work in progress; ore body calculated at 500,000 tons above level of railroad; samples of exported ore give on analysis: Manganese, 54.08 per cent; water, 7.06; phosphorus, 0.030; silica, 0.78. Another property at

Bucania employs 80 laborers on a lode 1 to 3 meters wide that is supposed to run very deep. The ore above the level of the railroad is calculated at 200,000 tons. This firm extracted 21,000 tons in 1898, of which only 16,000 tons were exported for lack of transportation facilities on the part of the railroad.

As far as can be made out from the information at hand the manganese-bearing layer at Miguel Burnier, on which the principal mines above mentioned are located, occurs in the upper part of a heavy bed of iron-mica schist or itabirite that rests on a heavy bed of limestone (also highly ferruginous) and is followed by an extensive series of argillaceous schists. Between the ore layer and the typical quartzose itabirite below it there is said to be a thin layer of compact iron ore and an argillaceous layer from 2 to 4 meters thick with lenticular masses of quartz, and often stained black with disseminated manganese that may rise as high as 50 per cent of clayey layer. Above the ore layer and between it and the argillaceous schist the succession is very similar; that is to say, a thin layer of iron ore followed by 2 to 4 meters of clay that in places at least contains manganese. Above all comes a layer of mixed iron and manganese oxides. It is not certain if the great mass of ferruginous schist below the ore body is manganese bearing or not, but as a small proportion of manganese has been noted in analysis of similar rocks from other localities it may be presumed to be so. In this case the ore is probably due to an enrichment of the upper part of a bed of ferruginous and manganiferous material which very probably was originally a carbonate according to the hypothesis of Vogt. On the other hand, the above description of the immediate associates of the ore body is very suggestive of an altered dike with ore segregations. The whole series from the limestone to the clay slates is metamorphosed and has since been so modified by weathering that the determination of its original character and composition becomes a difficult study for which the data at hand is insufficient.

The manganese ore exported from Brazil comes from the district of Miguel, in the State of Minas Geraes, about 300 miles from Rio de Janeiro. The greater portion of this ore, as in 1897, came to the United States, the amount received in 1898 being 17,031 tons.

COLOMBIA.

A detailed description of the manganese deposits of Panama, near the Caribbean Sea and about 45 miles northeast of Aspinwall, was given in a previous report. The amount shipped from this region to the close of 1896 was estimated at 18,215 tons, of which 10,500 were sent forward in 1896. The production in 1897 is not reported, but in 1898 8,595 tons were mined, extraordinary weather conditions interfering greatly with the operations.

CHILE.

It is difficult to obtain the exact amount of manganese ore produced in Chile during any particular year, as the only available figures are

those of the amount of ore exported. But as none is used in the country, all of it being forwarded by vessel to foreign ports, the figures of export are therefore practically those of production, and the statistics for the years 1893 to 1896, inclusive, with the values of the ore produced, taken from the British Consular Reports, represent the exports for these years.

Production of Chilean manganese ores, 1885 to 1896.

Year.	Quantity.	Total value. <i>s</i>	Year.	Quantity.	Total value. <i>s</i>
	<i>Long tons.</i>			<i>Long tons.</i>	
1885.....	4,041	.....	1891.....	34,462	.....
1886.....	23,928	.....	1892.....	50,871	\$399,881
1887.....	47,521	.....	1893.....	36,162	284,262
1888.....	18,713	.....	1894.....	47,238	371,374
1889.....	28,683	.....	1895.....	23,696	186,747
1890.....	47,966	.....	1896.....	25,740	202,335

s The English pound is taken as \$4.5665.

Mr. C. T. Ward, jr., of San Francisco de Limache, Chile, has prepared an excellent description of the manganese deposits of Chile, from which the following liberal excerpts have been taken:

Chile extends from 18° to 55° south latitude, and the manganese deposits mentioned by Mr. Ward all occur between latitude 27° and 34° south, Carrizal being farthest north, Coquimbo coming next, followed by Aculeo. It will therefore be noticed that the deposits are in the central part of Chile, and all upon the Pacific slope of the mountain ranges.

Dr. J. E. Thorner first discovered manganese in the Republic of Chile, South America, but was not aware of the value of the find. Subsequently, through Mr. William C. Tripler, of the United States, the article became one of export, and other discoveries of deposits in this country were made.

In the spring of 1882 Mr. Tripler left Chile for New York, taking with him a sample of Aculeo ores, and although the manganese was pronounced to be of excellent quality, no one could be induced to take steps to work the mines or invest capital in them, the excuse being "the isolated position of Chile, with the great difficulty of obtaining cheap freights to the United States." Mr. Tripler next visited England with his samples, and an experienced engineer was sent to Chile to report regarding the prospects and the advisability of investments.

The report being favorable, Dr. Thorner's interests were purchased for £20,000, and a contract was entered into to export 25,000 tons of the ores from Valparaiso. In 1884 the Aculeo Company, Limited, was incorporated in England, and the first exportation of manganese ore (466 tons) was made in March, 1888.

The location of the Aculeo mines being about 130 miles from Valparaíso, the nearest shipping port, and the expense of carriage costly, other deposits nearer the coast were sought.

In the province of Coquimbo, about 20 miles from railroad communication, and 50 miles from the port of Coquimbo, manganese ores were found in large quantities. After two years the business became organized, employing 250 men, and the yearly output of ores amounted to from 10,000 to 15,000 tons. This mine was incorporated in England in 1886, under the name of Swan's Chilean Mining Company, Limited, and after the business of this mine was fully under control and in good working order, other newly discovered deposits of manganese ores, farther north, about 50 miles from the port of Carrizal, were purchased, and a branch railroad was built from the mine to the Carrizal railroad.

In July, 1893, the Chilean Manganese Company, Limited, of Coquimbo and Carrizal was incorporated in England, with a capital of £125,000.

Thus far manganese has been found only between the latitudes of 27° and 34° south in detached locations, about 30 to 40 miles distant from the seashore, outside of this limit toward the Cordilleras no indications of the ores have been discovered.

Aculeo mines.—The first discovery of manganese ore in the Republic of Chile, South America, was on the rolling plains of the Hacienda de Aculeo. Aculeo is situated about 32 miles south from the city of Santiago, and 6 miles from the Southern Railroad depot at Hospital, where the material from the manganese mine is carried in ox carts for shipment per rail via Santiago to the port of Valparaíso for exportation. The manganese ore was originally found cropping out of the top of the hill, the lode being perpendicular, solid, with a dip of about 30° to the south. This hill stands by itself, runs north and south a distance of about 1,500 feet; its highest point or peak is estimated as being 350 feet. The work at this mine is principally by blasting; the ores are hard and brittle; they yield about 50 per cent of manganese and are of a reddish color or tinge somewhat like the oxide of iron. The city of Santiago is 556.77 meters above the level of the sea, and Aculeo, in the plain, is about 390 meters. Within a circuit of 50 miles from the Aculeo Hill no discoveries of manganese ores have been made, neither have any other metals been found. At present the work at this mine has partially ceased, owing to the deposits further north being more remunerative, the expense of working them and the cost of shipment being much less than in this place.

Corral Quemada.—Nearly 30 miles south from the city of Serena, upon the plains of Corral Quemada, in the province of Coquimbo, at an elevation of 1,431 meters above the level of the sea, are situated a group of forty manganese mines, all of which occur within a circumference of 5 miles. These mines are 20 miles distant from the railroad depot of Angostura, and from this station to the shipping port of Coquimbo is about 40 miles. The ore is taken to Angostura on pack

mules, ten being supposed to carry one ton, and 1,500 tons have been shipped in this way in a year.

Situated on the plain is a large mound called the Loma Negra, from the color of its manganese ores, about 700 meters long and about 15 meters high; the depth is at present not known, never having been sought for, as the ores of the plain are of a higher grade, exposed upon the surface of the earth, and cost less than if procured by tunnel. On the plain, unlike the mound, the ores are found in horizontal layers between earthy matter. The ores are said to exist in large quantities; no blasting is required, the crowbar being the principal mining tool in use for extracting the ores, which are soft, crumble easily, and are of a dark bluish color. Commercially the manganese of the plain is more valuable than that of the mound owing to its containing from 12 to 20 per cent of lime, making it desirable in the European market, it being valued at 2 shillings per unit over the Russian product. Within the mound of "Corral Quemada" are found lower grades of ores giving a small quantity of lime, and assaying about 30 per cent of manganese. At times discoveries are made of caves, within which are found the bones of large birds and sea shells.

Analyses of manganese ores from Chile.

Name of mine.	Man- ganese.	Insol. matter.	Silica.	Phos.	Copper.	Lime.	Moist- ure.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Santo Tomas mine....	51.65	8.40	5.95	Trace.	Trace.	8.90	0.15
Guillermo mine	50.08	9.63	4.73	Nil.	Nil.	4.90	0.27

Huasco district.—Upon the southern side of the Huasco River manganese ore has been found in perpendicular lodes, but of poor quality, in consequence of which all work upon the mines has been abandoned. It was proved that the ores were not of sufficient value for exportation. Upon the north bank, between it and the more northern mines, manganese has been discovered, but passing over the rising and rolling lands one arrives at the slightly sloping plains where the more lofty mountains appear. Below them is a separate ridge extending north and east for about 10 miles where the manganese deposits are situated. Beyond them is a plain about 20 miles square, where it is found in scattered patches about Salitre. It is of but few inches depth and of no value commercially. A little more than half a mile from the manganese deposits, and about eighteen miles from the Huasco River, there is a detached group of hills running east, and containing large and numerous deposits of manganiferous iron ore, yielding 70 per cent of this metal, but the cost of mining and carriage is too expensive to warrant outlays in working. Near Valparaiso, in the department of Limache, there is a large quantity of iron ores to be had of higher

grade, easier of access, which can be mined at a cheaper rate. The analysis of the Limache iron ores, by Mr. Henry F. Ede, gave 60.25 per cent iron; 0.39 manganese.

Mr. F. Bogen analyzed a hematite ore with 90 per cent peroxide, equal to metallic iron 63 per cent and insoluble material 2.25 per cent.

Carrizal district.—From the seaport of Carrizal there is a railroad which ascends, by a circuitous route, through the Quebradas, and over the mountain ridges to the rich copper mine of the "Cerro Blanco." The summit of the Cerro is 700 meters above the level of the sea. About 30 miles from the port of Carrizal, a branch has been built in a southerly direction 20 miles in length, connecting with the manganese district at the foot of the Ten Mile Mountains, where a spur forms a line of pyramids and mounds, the most notable and highest of which is the "Coquimbana," the "Porvenir" and "Cerro Negra" following in order.

Manganese is found upon the tops of the pyramids and mounds in perpendicular lodes and running down to an unknown depth. These lodes average from four to five meters in width, the spaces between the lodes consisting of reddish clay and sandstone. The Coquimbana has been worked on one side of its summit to a depth of sixty to seventy meters, with no decrease in the yield, and the same reports come from the shafts at the foothills; faults are found at times, but by close observations and triangulation measurement the lodes are again found, the levels being but slightly disturbed where the break occurs. Tunnels are being worked at the foot of the Coquimbana and Porvenir, besides which shafts have been sunk to the depth of seventy meters below the surface of the plain. The manganese ores in this district are hard and brittle, with a dark, bluish color. A day's labor of a miner consists in drilling two holes, each 20 inches deep, in a lode.

The following is a copy of the analyses of twelve samples of ores, each made and reported by Mr. William Sair:

Analyses of Chilean manganese ores.

	Manganese.	Silica.	Phosphorus.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Coquimbana	51.18	9.32	0.079
Porvenir	40.26	11.77	0.081
Monte Negra	48.85	8.40	0.090

The mines in this locality have been worked only a short time, but the ores seem to have the preference over others in Chile and in the United States, and it is reported that 25,000 tons have been contracted for delivery to Philadelphia. In Europe the ores containing a certain quantity of lime are preferred.

The surroundings of the Carrizal mines present a desolate appearance; the mountain ridges rise one above the other and are surmounted at last by the Cordilleras; between the lines of mountains are plains, valleys, and ravines, upon the spare soil of which grow the algerroba, brush-wood, and stunted herbs, but no trees are found. The country is dry, having no surface waters, rainfalls seldom occurring, and then only in a severe, stormy winter. In the west the mountains gradually decrease in size, finally ending in the sandy mounds along the coast of the Pacific Ocean.

EUROPE.

GREAT BRITAIN.

The Kingdom of Great Britain does not produce any true manganese ores, those mined being manganiferous iron ores. Figures for 1898 are not yet at hand, but those for the years 1884 to 1897, together with the value of the ores, are as follows:

Production and value of manganiferous ores in the United Kingdom from 1884 to 1897.

Year.	Quantity.	Value.	Year.	Quantity.	Value.
	<i>Tons.</i>			<i>Tons.</i>	
1884.....	909	\$6,921	1891.....	9,476	\$30,071
1885.....	1,688	11,669	1892.....	6,078	21,461
1886.....	12,763	52,722	1893.....	1,336	3,688
1887.....	13,777	53,772	1894.....	1,809	3,582
1888.....	4,342	9,361	1895.....	1,273	3,323
1889.....	8,852	31,354	1896.....	1,060	2,883
1890.....	12,444	32,588	1897.....	599	a 1,650

a Estimated.

FRANCE.

France produced in the year 1897, 36,624 long tons of manganese ores, and the table below gives the annual production and value from 1886 to 1897, inclusive, the latter being supplied by the Comite des Forges de France.

Production and value of manganese ores in France from 1886 to 1897.

Year.	Production.	Total value.	Value per ton.	Year.	Production.	Total value.	Value per ton.
	<i>Long tons.</i>				<i>Long tons.</i>		
1886....	7,555	\$53,099	\$7.03	1892....	31,894	\$205,074	\$6.43
1887....	11,932	50,501	4.23	1893....	37,406	290,073	7.75
1888....	10,873	60,757	5.59	1894....	32,239	192,264	5.96
1889....	9,842	59,000	5.99	1895....	30,385	177,698	5.85
1890....	15,731	89,517	5.69	1896....	30,797	179,297	5.82
1891....	15,101	90,316	5.98	1897....	36,624	.....	.....

BELGIUM.

Mr. P. Trasenter, of Liege, has supplied data as to the production of manganiferous iron ores in Belgium for a series of years, and the annexed table shows the output and value of these from 1880 to 1897, inclusive.

These iron ores contain from 15 to 20 per cent of manganese and 15 to 20 per cent of iron.

Production of manganiferous iron ores in Belgium from 1880 to 1897.

Year.	Product.	Value.	Year.	Product.	Value.
	<i>Tons.</i>	<i>Francs.</i>		<i>Tons.</i>	<i>Francs.</i>
1880.....	700	4,000	1889.....	20,905	248,000
1881.....	770	4,000	1890.....	14,255	176,000
1882.....	345	1,750	1891.....	18,498	254,600
1883.....	820	4,100	1892.....	16,775	208,300
1884.....	750	3,750	1893.....	16,800	201,000
1885.....	.....	.....	1894.....	22,048	277,700
1886.....	750	9,000	1895.....	22,478	286,270
1887.....	12,750	155,850	1896.....	23,265	345,020
1888.....	27,787	325,000	1897.....	28,372	342,700

GERMANY.

Germany uses considerable amounts of manganese ores, supplementing her native ores with those of other countries. The greater portion of the home supply is furnished by Prussia, the tables below giving

MANGANESE ORES.

149

the production of manganese ores in Germany from 1890 to 1897, and the production and value of the Prussian ores from 1881 to 1897:

Production of manganese ores in Germany from 1890 to 1897.

Year.	Quantity.
	<i>Long tons.</i>
1890.....	41, 180
1891.....	39, 698
1892.....	32, 341
1893.....	40, 057
1894.....	43, 012
1895.....	40, 674
1896.....	44, 350
1897.....	45, 694

Production and value of manganese ores in Prussia from 1881 to 1897.

Year.	Product.	Value.	Year.	Product.	Value.
	<i>Long tons.</i>			<i>Long tons.</i>	
1881.....	10, 911	\$79, 104	1890.....	39, 497	\$174, 428
1882.....	4, 597	33, 745	1891.....	36, 278	174, 624
1883.....	4, 502	28, 423	1892.....	30, 892	101, 844
1884.....	7, 629	43, 118	1893.....	38, 384	93, 506
1885.....	14, 464	81, 302	1894.....	41, 854	94, 992
1886.....	24, 649	177, 066	1895.....	39, 296	100, 832
1887.....	35, 957	228, 439	1896.....	42, 925	97, 469
1888.....	26, 877	147, 250	1897.....	44, 538	96, 185
1889.....	43, 311	216, 381			

ITALY.

Italy has deposits of both manganese and manganiferous ores, the latter being wrought in an intermittent manner, and in some instances mining has been interrupted for years.

The following table, which has been prepared for this report from the

official statistics by Chevalier Celso Capacci, shows the production of these ores and their value from 1860 to 1897, inclusive:

Production of manganese and manganiferous iron ores in Italy from 1860 to 1897.

Year.	Manganese ores.		Manganiferous iron ores.	
	Production.	Value.	Production.	Value.
	<i>Long tons.</i>		<i>Long tons.</i>	
1860.....	642	\$12, 373		
1861.....	515	9, 174		
1862.....	1, 714	15, 661		
1863.....	714	6, 674		
1864.....	712	8, 567		
1865.....	571	6, 716		
1866.....	711	7, 191		
1867.....	677	8, 079		
1868.....	661	7, 894		
1869.....	758	10, 403		
1870.....	630	8, 646		
1871.....	779	9, 793		
1872.....	1, 125	12, 311		
1873.....	3, 103	46, 548		
1874.....	3, 169	58, 697	3, 445	\$6, 755
1875.....	3, 750	64, 341	19, 684	96, 500
1876.....	6, 800	61, 074	22, 878	93, 315
1877.....	6, 704	56, 546	7, 874	26, 248
1878.....	6, 550	46, 567	6, 368	15, 297
1879.....	5, 614	33, 842	1, 366	2, 679
1880.....	6, 373	40, 682	20, 148	63, 214
1881.....	8, 629	45, 219	<i>a</i> 29, 526	<i>a</i> 92, 640
1882.....	6, 868	67, 201	<i>a</i> 29, 526	<i>a</i> 92, 640
1883.....	11, 204	52, 975	8, 858	27, 792
1884.....	871	7, 570		
1885.....	1, 774	10, 899		
1886.....	5, 473	30, 943		
1887.....	4, 363	21, 872		
1888.....	3, 573	15, 054		
1889.....	2, 168	9, 998		
1890.....	2, 113	10, 050		
1891.....	2, 391	12, 467		
1892.....	1, 223	8, 067	4, 549	8, 028
1893.....	797	6, 320	8, 666	14, 445
1894.....	748	4, 536	5, 718	8, 971
1895.....	1, 544	13, 634		
1896.....	1, 860	19, 734	9, 842	19, 300
1897.....	1, 608	14, 483	20, 926	32, 829

a In original, 80,000 metric tons valued at 480,000 lire, possibly an estimate.

SPAIN.

Mr. Carlos Sundheim, M. E., supplied additional statistics of the mining of manganese ores in Spain. The greater portion of ore produced is a carbonate and silicate obtained in the province of Huelva. The amount of this character of ore mined in the year ending December 31, 1898, was 138,062 metric or 135,882 long tons, from the province of Huelva, and in addition 300 tons of oxide of manganese, carrying 50 per cent of manganese, from the provinces of Oviedo and Teruel, making a total for the country of 136,182 long tons. The latter two provinces will not be important producers until railroads are built to the mines.

The ore is exported principally to Belgium and Luxemburg. The various countries to which the ore was sent in 1898 and the amount forwarded to each from the province of Huelva are as follows:

Exports of Huelva manganese ores in 1898.

Country to which exported.	Quantity.
	<i>Metric tons.</i>
Belgium and Luxemburg	126,769
France	6,586
England	4,179
Germany	528
Total	138,062

Of this ore one-half is silicate, averaging 33 per cent of manganese and 30 to 37 per cent of silica. The grades of ore as shipped yield 40 to 47 per cent of manganese with 16 per cent of silica, 36 to 39 per cent of manganese with 16 per cent of silica, 34 per cent of manganese with 16 per cent of silica, and 30 per cent of manganese with no guaranty as to silica.

The production of manganese ores in Spain from 1890 to 1898, inclusive, is as follows:

Production of manganese ores in Spain from 1890 to 1898.

Year.	Quantity.	Year.	Quantity.
	<i>Long tons.</i>		<i>Long tons.</i>
1890.....	9,716	1895.....	26,946
1891.....	6,883	1896.....	90,546
1892.....	16,643	1897.....	101,937
1893.....	1,437	1898.....	136,182
1894.....	423		

No statistics are reported separately of the production of manganiferous iron ores, it being all classified as "iron ore;" but Mr. Sundheim

has supplied the following quantities, showing the exports of manganiferous iron ore by ports for the years named:

Exports of manganiferous iron ores from Spain for three years.

Port.	1896.	1897.	1898.
	<i>Metric tons.</i>	<i>Metric tons.</i>	<i>Metric tons.</i>
Cartagena.....	277,836	360,495	317,068
Aguilas	17,868	68,510	55,830
Mazarron		18,970	18,700
Portman			26,175
Total	295,704	447,975	417,793

AUSTRIA.

Austria is a regular producer of manganese ores, most of which are utilized in home industries. The table given below will show the production from 1876 to 1895, inclusive:

Production of manganese ore in Austria from 1876 to 1895.

Year.	Product.	Year.	Product.
	<i>Centners.</i>		<i>Centners.</i>
1876.....	67,817	1886.....	92,464
1877.....	78,999	1887.....	93,108
1878.....	41,836	1888.....	65,541
1879.....	34,337	1889.....	39,261
1880.....	88,744	1890.....	80,068
1881.....	91,097	1891.....	52,793
1882.....	84,183	1892.....	46,000
1883.....	93,821	1893.....	54,000
1884.....	79,423	1894.....	101,120
1885.....	61,577	1895.....	a 92,270

a Including Bosnia.

In 1896 Bosnia produced 125,000 centners of manganese ore.

According to the British consular reports the production of manganese ore in Bosnia and Herzegovina was as follows:

Production of manganese ore in Bosnia and Herzegovina.

Year.	Quantity.
	<i>Long tons.</i>
1892.....	7,819
1895.....	8,016
1896.....	a 6,713

a Value \$45,694.

SWEDEN.

This country has been a constant producer of manganese ores, but in late years the industry has declined. Dr. Richard Åkerman, of Stockholm, has furnished for this report the following table (which has been altered to correspond with United States standards, long tons), showing the production of manganese ores in Sweden from 1888 to 1897, inclusive:

Production of manganese ores in Sweden, 1888 to 1897.

Year.	Product.	Value.
	<i>Long tons.</i>	
1888.....	9,537	
1889.....	8,509	
1890.....	10,529	
1891.....	8,936	
1892.....	7,708	
1893.....	6,949	
1894.....	3,306	
1895.....	3,068	
1896.....	2,023	\$7,197
1897.....	2,706	12,616

RUSSIA.

Probably the richest and most extensively exploited deposits in the world are those of the Trans-Caucasian district of Russia. The high freight rates prevailing have, however, been a factor in restricting the expansion of this industry, so that in May, 1898, the mine owners petitioned the Government for a reduction of the freight tariff from 10 kopecks to 3 kopecks per pood (36 pounds avoirdupois), the improvement of the roads from the mines to the railway, for laws regulating the production of manganese ore, for organizing a general syndicate which would control the sale of Caucasian ores, and for the expediency of granting a credit to the industry for the proposed syndicate. To the close of 1898 these representations were said to have been unsuccessful.

In the report for 1897 a detailed description of the manganese-ore industry of the Caucasus was given, and in the table below will be found the production and exports from 1885 to 1897, revised and corrected; also a statement of the exports from Poti and Batoum, the shipping ports of this region, showing the principal countries to which the manganese ore was sent.

Production and exports of Caucasian manganese ore.

Year.	Production.	Exports.	Year.	Production.	Exports.
	<i>Long tons.</i>	<i>Long tons.</i>		<i>Long tons.</i>	<i>Long tons.</i>
1885.....	58,722	41,396	1892.....	165,101	129,835
1886.....	67,985	53,751	1893.....	166,420	126,630
1887.....	51,890	59,523	1894.....	180,533	157,275
1888.....	29,401	49,076	1895.....	160,277	185,718
1889.....	68,439	55,489	1896.....		166,224
1890.....	168,840	135,492	1897.....	231,868	210,106
1891.....	98,670	84,040			

Distribution of exports of Caucasian manganese ore.

Country to which exported.	1893.	1894.	1895.	1896.	1897.
	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>
Great Britain	42,930	65,110	60,616	77,754	68,650
France	4,100		150	5,650	
Russia		9,890	9,600	20,175	28,446
Belgium	3,125	2,520		220	
Germany	40,405	51,455	59,565	58,825	70,810
United States	36,070	28,300	55,787	3,600	42,200
Total exports.....	126,630	157,275	185,718	166,224	210,106

ASIA.

INDIA.

Manganese deposits exist along the East Coast Railway in the Vizianagram State, Vizagapatam district, and are found in large quantities in the Chipurupalle taluq of that State. These are chiefly "pockets" close to the surface, reported to be of good quality. Manganese ores are also found in the trap rocks of Belgaum, Dhawar, and Ratnagiri districts, in the Bombay Presidency.

Jhabua, in central India, is also said to possess valuable supplies of this mineral, not as yet employed industrially. But the most famous and in some respects perhaps the most promising locality for future development is Gosalpur, in the Jabalpur district of the central provinces. It has been reported that a lease was granted of these mines to a European firm, but in the returns of 1895, the latest obtainable, no mention is made of any progress. Last year's Review stated that the ore was extracted by laborers who wash it in the Hiram stream before exportation.

An extensive bed of ore, thought to be of several square miles in extent, is reported in Lower Burmah. Three localities are specified, viz, the bank of the Thugo stream, the bank of the Thirabuen, and the great Tennasserim River. The ores are stated to consist of black and gray oxides and wad.

In the year 1893 the Madras Presidency (the only province known to export this mineral) produced 3,130 tons of manganese ore; in 1894 this quantity rose to 11,410 long tons; in 1895 to 15,816 long tons, and in 1896 to 56,869 long tons, which probably should be somewhat greater. The published reports of exportation from Madras in 1895 show that the exports amounted to 22,758 tons, as will be seen from the following table:

Exports of manganese ore from British India by sea to other countries during the four years from 1892 to 1896.

Year.	Number of tons.
1892-93.....	1,000
1893-94.....	1,650
1894-95.....	6,416
1895-96.....	22,758

JAPAN.

No statistics have been obtained in reference to the production of manganese ore in the Kingdom of Japan, but the monthly returns of the foreign trade of the Empire of Japan, Department of Finance, give the statistics of the manganese ore annually exported, together with the values of the same. According to these returns the production from 1881 to 1898, inclusive, have been as follows; the figures for 1893-1898, inclusive, being those of exportations:

Production and exports of manganese ores in Japan from 1881 to 1898.

Year.	Product.	Total value.	Year.	Product.	Total value.
	<i>Long tons.</i>			<i>Long tons.</i>	
1881.....	2	.....	1890.....	2,604	.....
1882.....	156	.....	1891.....	3,178	.....
1883.....	151	.....	1892.....	4,948	.....
1884.....	125	.....	1893.....	18,510	\$106,016
1885.....	123	.....	1894.....	17,465	99,007
1886.....	404	.....	1895.....	16,338	97,906
1887.....	312	.....	1896.....	20,785	136,668
1888.....	813	.....	1897.....	14,524	102,248
1889.....	945	.....	1898.....	9,905	77,853

AUSTRALASIA.

QUEENSLAND.

Queensland produces a small amount of manganese ores, and its output from 1881 to 1897 has been as follows:

Production and value of manganese ores in Queensland from 1881 to 1897.

Year.	Product.	Value.	Year.	Product.	Value.
	<i>Tons.</i>			<i>Tons.</i>	
1881.....	87	\$1,263	1892.....		
1882.....	100	1,694	1893.....		
1883.....	20	290	1894.....	140	\$1,936
1884.....	55	799	1895.....	355	5,387
1889.....	4	87	1896.....	300	4,380
1890.....	5	97	1897.....	300	5,475
1891.....	10	126			

WORLD'S PRODUCTION OF MANGANESE ORES.

While it is impossible to procure late data in regard to all the countries which produce manganese ores, the following table, showing the amounts mined in the various countries, has been collated from the latest available statistics:

World's production of manganese ores.

Country.	Year.	Product.
North America:		<i>Long tons.</i>
United States	1898	15,957
Canada	1898	44
Cuba ^a	1898	950
South America:		
Brazil ^a	1898	34,900
Chile ^a (exports).....	1896	25,740
Colombia ^a	1898	8,595
Europe:		
Austria	1895	5,904
Bosnia	1896	6,713
France ^a	1897	36,624
Germany ^a	1897	45,694
Greece		
Italy	1897	1,608
Portugal		
Russia ^a	1897	231,868

^a Countries so marked contributed to the manganese supply of the United States in 1898, and in addition ore was obtained from Mexico, England, Scotland, and the Dutch West Indies.

World's production of manganese ores—Continued.

Country.	Year.	Product.
Europe—Continued:		
Spain	1898	Long tons. 136, 182
Sweden	1897	2, 706
Turkey ^a		^b 15, 000
Asia:		
India ^a	1896	56, 869
Japan ^a	1898	9, 905
Oceania:		
New South Wales	1897	None.
New Zealand		
Queensland	1897	300
South Australia	1897	None.

^a Countries so marked contributed to the manganese supply of the United States in 1898, and in addition ore was obtained from Mexico, England, Scotland, and the Dutch West Indies.

^b Estimated.

CHARACTERISTICS OF MANGANESE ORES.

Manganese is not found in a metallic state in nature, but always in combination with one or more of the other elementary substances, and usually occurs as oxide, silicate, or carbonate. According to Dana the ores of manganese have a specific gravity below 5.2. They afford a violet-blue color with borax or salt of phosphorus in the outer flame of the blowpipe; and on heating the oxide with muriatic acid, fumes of chlorine derived from the acid are given out. The oxides are the most common manganese minerals, but rhodonite and rhodochrosite, respectively a silicate and carbonate of manganese, are of frequent occurrence. The most important ores in a commercial sense are the oxides, pyrolusite, psilomelane, braunite, manganite, hausmannite, and wad, and a brief description of each will be given below.

Pyrolusite peroxide, or binoxide of manganese (MnO_2), is of an iron-black color, giving a black streak on a test plate, with a hardness of 2 to 2.25, and a specific gravity of 4.8 to 5. When pure, it will yield 63.22 per cent of manganese and 36.78 per cent of oxygen. It is used in the manufacture of ferro-manganese, in the production of chlorine, and in freeing glass from the brown or green color given it by iron, deriving its name from the latter fact.

Psilomelane is one of the most abundant ores of manganese, and usually occurs associated with pyrolusite. It is also a binoxide or peroxide of manganese, but contains varying amounts of water, potash, and baryta. It has a hardness of 5 to 6 (much harder than pyrolusite) and a specific gravity from 4 to 4.4. It is heavy black, steel-blue or greenish-black in color. Its uses are the same as pyrolusite, and by some is considered an impure variety of pyrolusite. The manganese

contents range, when the ore is pure, from 45 to 60 per cent, depending upon the percentage of other ingredients.

Braunite is an anhydrous oxide of manganese, usually containing silica. It is a heavy black or brownish-black ore, giving a brownish-black streak and submetallic luster on the test plate. It has a hardness of 6 to 6.5, and a specific gravity of 4.8. When pure, which is rarely the case, it contains 69 per cent of metallic manganese, but it usually is found to contain silica.

Manganite, a hydrous sesquioxide of manganese, having the formula $Mn_2O_3 \cdot H_2O$, is of a steel-black or iron-black color, with a hardness of 4 to 4.5, and a specific gravity of 4.3 to 4.4. When the water is removed from manganite it changes to pyrolusite, hausmannite, or braunite, and in some cases the latter minerals are supposed to be altered manganite, this being especially true of pyrolusite.

Hausmannite is a double proto-binoxide of manganese, having a formula $2 MnO, MnO_2$. It is of a brownish-black color and submetallic luster, having a hardness from 5 to 5.5, and a specific gravity of 4.7. It is a rare mineral, which, when pure, contains 72.1 per cent of manganese and 29.9 per cent of oxygen.

Wad, or bog manganese, is an impure peroxide of manganese, the percentage of which varies from 30 to 70 of manganese with peroxide of iron, 10 to 25 per cent of water, and often several per cent of oxide of cobalt or copper, and sometimes nickel. Its hardness is given as from 1 to 6, and its specific gravity 3 to 4. The color varies from brown to black. It occurs in irregular masses in clay as solid beds several feet thick. On account of its impurities it is not used as a source of manganese or chlorine, but is occasionally used as the basis of a black or brown paint.

USES OF MANGANESE ORES.

The uses of manganese and its compounds are principally as follows:

It alloys with iron in spiegeleisen and ferro-manganese; with copper; with or without iron, in "manganese bronze;" with aluminum, zinc, copper, and silicon in "silver bronze;" also with aluminum, zinc, tin, lead, magnesium, etc.

The ores are employed as oxidizers in the manufacture of chlorine and bromine; as decolorizers of glass, and also for coloring it; as driers in varnishes and paints; in Leclanche batteries; in the preparation of oxygen on a small scale, and in the manufacture of disinfectants, such as manganates and permanganates.

They are also used as coloring material in calico printing and dyeing, coloring glass, pottery, and brick, and in green and violet paints.

In the West they are largely used as a flux in the smelters, the mineral used being manganiferous iron ore, or an argentiferous iron ore.

Some varieties of manganese ores are also utilized to a limited extent in medicine, in chemical laboratories, and in jewelry manufacture.

COPPER.

By CHARLES KIRCHHOFF.

GENERAL TRADE CONDITIONS.

The year 1898 has been one of general prosperity for the copper-mining industry, the full product being marketed at prices slightly better than those of 1897, which were adequately remunerative. The actual scarcity of copper, with its accompanying upward rush in prices and its enormous expansion of stock speculation, did not in reality develop until the end of the year. It did not tell upon the returns for the year 1898.

As expected, the increase in the production of copper was largest in Arizona, while the lake district also recorded an advance. Montana, largely because of hampering conditions affecting the leading producer, fell off considerably.

Intense activity has developed in the search for new copper mines, and a large number of new undertakings have been started. But the preparations for output on even a moderate scale in the way of opening up mining property and providing reduction plant are so large and require so much time that few of the newcomers will add materially to the copper market for 1899. What increase there will be will come from the older mines, and that chiefly from Arizona, the lake, California, and Utah.

Great excitement was created in copper circles by the floating of the Amalgamated Copper Company, subscriptions for \$75,000,000 of stock being asked. No official statement relative to the constituent companies has ever been made, but it is reported that the new organization has secured control of the Anaconda, Washoe, Parrott, and Colorado Smelting Company in the Butte district and properties in the lake district.

PRODUCTION.

The following table shows the production of copper in the United States from its first rise to the dignity of an industry. For the earlier

years the best available sources have been drawn upon for the estimates given. Since 1882 the figures are those collected by this office:

Production of copper in the United States from 1845 to 1898.

[Long tons.]

Year.	Total production.	Lake Superior.	Calumet and Hecla.	Percentage of Lake Superior of total product.
1845.....	100	12	.....	12
1846.....	150	26	.....	17.3
1847.....	300	213	.....	71
1848.....	500	461	.....	92.2
1849.....	700	672	.....	96
1850.....	650	572	.....	88
1851.....	900	779	.....	86.6
1852.....	1,100	792	.....	72
1853.....	2,000	1,207	.....	64.9
1854.....	2,250	1,819	.....	80.8
1855.....	3,000	2,593	.....	86.4
1856.....	4,000	3,666	.....	91.7
1857.....	4,800	4,255	.....	88.6
1858.....	5,500	4,088	.....	74.3
1859.....	6,300	3,985	.....	63.3
1860.....	7,200	5,388	.....	74.8
1861.....	7,500	6,713	.....	89.5
1862.....	9,000	6,065	.....	67.4
1863.....	8,500	5,797	.....	68.2
1864.....	8,000	5,576	.....	69.7
1865.....	8,500	6,410	.....	75.4
1866.....	8,900	6,138	.....	69
1867.....	10,000	7,824	603	78.2
1868.....	11,600	9,346	2,276	80.6
1869.....	12,500	11,886	5,497	95.1
1870.....	12,600	10,992	6,277	87.2
1871.....	13,000	11,942	7,242	91.9
1872.....	12,500	10,961	7,215	87.7
1873.....	15,500	13,433	8,414	86.7
1874.....	17,500	15,327	8,984	87.6
1875.....	18,000	16,089	9,586	89.4
1876.....	19,000	17,080	9,683	89.9
1877.....	21,000	17,422	10,075	83
1878.....	21,500	17,719	11,272	82.4
1879.....	23,000	19,129	11,728	83.2
1880.....	27,000	22,204	14,140	82.2

COPPER.

161

Production of copper in the United States from 1845 to 1898—Continued.

[Long tons.]

Year.	Total production.	Lake Superior.	Calumet and Hecla.	Percentage of Lake Superior of total product.
1881.....	32,000	24,363	14,000	76.1
1882.....	40,467	25,439	14,309	62.9
1883.....	51,574	26,653	14,788	51.6
1884.....	64,708	30,961	18,069	47.8
1885.....	74,052	32,209	21,093	43.5
1886.....	76,430	36,124	22,553	51.3
1887.....	81,017	33,941	20,543	41.9
1888.....	101,054	38,604	22,453	38.2
1889.....	101,239	39,364	21,727	38.7
1890.....	115,966	45,273	26,727	38.9
1891.....	126,839	50,992	.....	40.2
1892.....	154,018	54,999	.....	35.7
1893.....	147,033	50,270	.....	34.2
1894.....	158,120	51,031	.....	32.3
1895.....	169,917	57,737	34,455	34
1896.....	205,384	64,073	40,338	31.2
1897.....	220,571	64,858	39,455	29.4
1898.....	235,050	66,291	.....	30.1

In detail, the production of copper, territorially distributed, has been as follows since 1883:

Total copper production in the United States, 1883 to 1887.

Source.	1883.	1884.	1885.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>
Lake Superior.....	59,702,404	69,353,202	72,147,889
Arizona.....	23,874,963	26,734,345	22,706,366
Montana.....	24,664,346	43,093,054	67,797,864
New Mexico.....	823,511	59,450	79,839
California.....	1,600,862	876,166	469,028
Utah.....	341,885	265,526	126,199
Colorado.....	1,152,652	2,013,125	1,146,460
Wyoming.....	962,468	.....	.....
Nevada.....	288,077	100,000	8,871
Idaho.....	.....	46,667	40,381
Missouri.....	260,306	230,000	.....
Maine and New Hampshire.....	212,124	249,018	211,602
Vermont.....	400,000	655,405	

MINERAL RESOURCES.

Total copper production in the United States, 1883 to 1887—Continued.

Source.	1883.	1884.	1885.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>
Southern States	395, 175	317, 711	40, 199
Middle States	64, 400	2, 114	190, 641
Lead desilverizers, etc	782, 880	950, 870	910, 144
Total domestic copper	115, 526, 053	144, 946, 653	165, 375, 483
From imported pyrites and ores	1, 625, 742	2, 858, 754	5, 086, 841
Total (including copper from imported pyrites)	117, 151, 795	147, 805, 407	170, 962, 324

Source.	1886.	1887.
	<i>Pounds.</i>	<i>Pounds.</i>
Lake Superior	80, 918, 460	76, 028, 697
Arizona	15, 657, 035	17, 720, 462
Montana	57, 611, 621	78, 699, 677
New Mexico	558, 385	283, 664
California	430, 210	1, 600, 000
Utah	500, 000	2, 500, 000
Colorado	409, 306	2, 012, 027
Wyoming		
Nevada	50, 000	
Idaho		
Missouri		
Maine and New Hampshire	315, 719	200, 000
Vermont		
Southern States	29, 811	
Middle States		
Lead desilverizers, etc	1, 282, 496	2, 432, 804
Total domestic copper	157, 763, 043	181, 477, 331
From imported pyrites and ores	4, 500, 000	3, 750, 000
Total (including copper from imported pyrites)	162, 263, 043	185, 227, 331

Since 1888 the production has been as follows, in detail:

Total copper production in the United States, 1888 to 1898.

Source.	1888.	1889.	1890.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>
Lake Superior.....	86,472,034	88,175,675	101,410,277
Arizona.....	31,797,300	31,586,185	34,796,689
Montana.....	97,897,968	98,222,444	112,980,896
New Mexico.....	1,631,271	3,686,137	850,034
California.....	1,570,021	151,505	23,347
Utah.....	2,131,047	65,467	1,006,636
Colorado, including copper smelters (a).....	1,621,100	1,170,053	3,585,691
Wyoming.....	232,819	100,000	.....
Nevada.....	50,000	26,420	.....
Idaho.....	50,000	156,490	87,243
Washington.....	.....	.....	.....
Maine and New Hampshire.....	271,631	72,000	378,840
Vermont.....			
Southern States.....	18,201	18,144	
Middle States.....	.....	.....	.....
Lead desilverizers, etc.....	2,618,074	3,345,442	4,643,439
Total domestic copper.....	226,361,466	226,775,963	259,763,092
From imported pyrites and ores....	4,909,156	5,190,252	6,017,041
Total (including copper from imported pyrites).....	231,270,622	231,966,214	265,780,133

^a Copper smelters in Colorado, purchasing argentiferous copper ores and mattes in the open market, sources not known. The quantity of Montana matte which goes to one of these works has been deducted.

Total copper production in the United States, 1888 to 1898—Continued.

Source.	1891.	1892.	1893.	1894.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>
Lake Superior.....	114,222,709	123,198,460	112,605,078	114,308,870
Arizona.....	39,873,279	38,436,099	43,902,824	44,514,894
Montana.....	112,063,320	163,206,128	155,209,133	183,072,756
New Mexico.....	1,233,197	1,188,796	280,742	31,884
California.....	3,397,405	2,980,944	239,682	120,000
Utah.....	1,562,098	2,209,428	1,135,330	1,147,570
Colorado, including copper smelters (a)...	6,336,878	7,593,674	7,695,826	6,481,413
Wyoming.....				
Nevada.....			20,000	
Idaho.....	146,825	226,000	36,367	
Washington.....			39,785	
Maine and New Hamp- shire.....				
Vermont.....	296,463	467,448	732,793	2,374,514
Southern States.....				
Middle States.....				
Lead desilverizers, etc. (b).....	4,989,590	5,491,702	7,456,838	2,136,473
Total domestic copper.....	284,121,764	344,996,679	329,354,398	354,188,874
From imported pyrites and ores and regulus.	11,690,312	7,973,065	10,431,574	10,678,434
Total (including copper from imported py- rites).....	295,812,076	352,971,744	339,785,972	364,866,808

a Copper smelters in Colorado, purchasing argentiferous copper ores and mattes in the open market, sources not known. The quantity of Montana matte which goes to one of these works has been deducted.

b For 1894 the quantity stated covers only that part of the incidental copper product the source of which could not be ascertained.

COPPER.

165

Total copper production in the United States, 1883 to 1898—Continued.

Source.	1885.	1886.	1887.	1888.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>
Lake Superior.....	129,330,749	143,524,069	145,282,059	158,491,703
Arizona.....	47,963,553	72,934,927	81,530,735	111,158,246
Montana.....	190,172,150	221,918,179	230,288,141	206,173,157
New Mexico.....	143,719	2,701,664	701,892	1,592,371
California.....	218,332	690,237	11,987,772	16,925,634
Utah.....	2,184,708	3,502,012	3,919,010	3,750,000
Colorado, including copper smelters (a) ..	6,079,243	6,022,176	11,873,033	16,274,561
Wyoming.....				233,044
Nevada.....				437,396
Idaho.....	1,425,914		183,277	1,266,920
South Dakota.....			2,440,338	1,261,393
Maine and New Hamp- shire.....				
Vermont.....	3,105,036	4,704,993	4,472,017	5,395,226
Tennessee and Southern States.....				
Middle States.....				
Lead desilverizers, etc. (b).....		4,063,173	1,400,000	3,553,336
Total domestic copper.....	380,613,404	460,061,430	494,078,274	526,512,987
From imported pyrites and ores and regulus.	c 5,300,000	c 5,900,000	c 12,000,000	c 19,750,000
Total (including copper from im- ported pyrites)	385,913,404	465,961,430	506,078,274	546,262,987

a Copper smelters in Colorado, purchasing argentiferous copper ores and mattes in the open market, sources not known. The quantity of Montana matte which goes to one of these works has been deducted.

b For 1886 the quantity stated covers only that part of the incidental copper product the source of which could not be ascertained.

c Estimated.

The available supply for the domestic markets may be computed as follows:

Supply of copper for the United States, 1891 to 1898.

Source.	1891.	1892.	1893.	1894.
Production of domestic copper	<i>Pounds.</i> 284, 121, 764	<i>Pounds.</i> 344, 998, 679	<i>Pounds.</i> 329, 354, 398	<i>Pounds.</i> 354, 188, 374
Imports:				
Fine copper in ore, entered for consumption	8, 931, 554	7, 669, 978	7, 256, 015	4, 804, 614
Fine copper in regulus, entered for consumption	2, 403, 919	303, 087	3, 175, 559	5, 873, 820
Bars and ingots	2, 556	22, 097	554, 348	606, 415
Old copper	134, 407	71, 485	59, 375	160, 592
Total	295, 594, 200	353, 065, 326	340, 399, 695	365, 633, 815
Exports:				
Ingots and bars	69, 279, 024	30, 515, 736	138, 984, 128	162, 393, 000
Estimated fine copper contents of matte	50, 000, 000	66, 000, 000	50, 000, 000	5, 750, 000
Total	119, 279, 024	96, 515, 736	188, 984, 128	168, 143, 000
Available supply .	176, 315, 176	256, 549, 590	151, 415, 567	197, 490, 815

Source.	1895.	1896.	1897.	1898.
Production of domestic copper	<i>Pounds.</i> 380, 613, 404	<i>Pounds.</i> 460, 061, 430	<i>Pounds.</i> 494, 078, 274	<i>Pounds.</i> 526, 512, 987
Imports:				
Fine copper in ore, entered for consumption	a 5, 300, 000	a 5, 900, 000	a 12, 000, 000	a 19, 750, 000
Fine copper in regulus, entered for consumption				
Bars and ingots	7, 979, 322	9, 074, 379	16, 923, 098	50, 840, 000
Old copper	1, 336, 901	2, 422, 554		
Total	395, 229, 627	477, 458, 363	523, 001, 372	597, 102, 987
Exports:				
Ingots and bars	121, 328, 390	258, 473, 285	277, 255, 742	291, 955, 905
Estimated fine copper contents of matte	15, 200, 000	22, 881, 936	11, 000, 000	5, 420, 000
Total	136, 528, 390	281, 355, 221	288, 255, 742	297, 375, 905
Available supply .	258, 701, 337	196, 103, 142	234, 745, 630	299, 727, 082

a Estimated.

The imports of fine copper in ore, pyrites, nickel matte, and copper matte are estimated, as explained in detail further on. From the official returns of imports of bars there is deducted a specified quantity estimated to have been returned to this country from Mexico. In the exports this copper in matte exported to Mexico is also deducted.

A considerable part of the quantity of copper produced and imported is converted and marketed at home and abroad as sulphate or blue vitriol.

This statement leaves out of account the stocks concerning which no reliable data are obtainable.

Since July, 1892, Mr. John Stanton, of New York, has collected monthly, from sworn returns, the following figures showing the production of the leading mines of Lake Superior, Montana, and Arizona. The estimate of outside sources is drawn, particularly recently, from official returns of the principal smaller mines.

American product of copper.

[Long tons.]

Year.	Reporting mines.	Outside sources.	Total.
Second six months of 1892.....	59,239	6,287	65,526
1893.....	129,760	12,730	142,490
1894.....	142,543	17,080	159,623
1895.....	155,497	15,700	171,197
1896.....	189,494	14,400	203,894
1897.....	204,206	11,900	216,106
1898.....	216,222	18,050	234,272

The monthly reports, in detail, for the years 1892, 1893, and 1894 are published in Mineral Resources for 1895, and for the years 1895 and 1896 in Mineral Resources for 1896. For 1897 and 1898 and for the first six months of 1899 the monthly production was as follows:

American product of copper, monthly, 1897, 1898, and the first half of 1899.

[Long tons.]

Year and month.	Reporting mines.	Outside sources.	Total.
1897.			
January	16,937	700	17,637
February	16,119	700	16,819
March	17,583	700	18,283
April	16,554	900	17,454
May	17,805	1,000	18,805
June	18,653	1,000	19,653
July	14,244	1,100	15,344
August	16,309	1,100	17,409
September	16,343	1,100	17,443
October	16,341	1,200	17,541
November	16,227	1,200	17,427
December	21,091	1,200	22,291
Total	204,206	11,900	216,106
1898.			
January	16,544	1,200	17,744
February	16,072	1,250	17,322
March	19,131	1,250	20,381
April	21,609	1,300	22,909
May	21,391	1,350	22,741
June	17,940	1,450	19,390
July	14,452	1,600	16,052
August	17,908	1,600	19,508
September	17,064	1,700	18,764
October	19,429	1,700	21,129
November	18,050	1,800	19,850
December	16,632	1,850	18,482
Total	216,222	18,050	234,272
1899.			
January	16,774	1,850	18,624
February	17,899	2,000	19,899
March	19,918	2,000	21,918
April	17,854	2,100	19,954
May	19,832	2,250	22,082
June	19,710	2,300	22,010
First half 1899	111,987	12,500	124,487

A considerable number of foreign mines, including those of the Peninsula, the Cape, Australia, Germany, and Mexico, report monthly to a secretary in London since July, 1892. During the last six months of 1892, and in 1893, 1894, 1895, 1896, 1897, 1898, and the first four months of 1899 the product of this group, which retains friendly relations with the American Producers' Association, has been as follows:

Foreign reporting mines.

Year.	Quantity.
	<i>Long tons.</i>
Second half 1892.....	39,655
1893.....	81,785
1894.....	88,531
1895.....	86,178
1896.....	86,196
1897.....	88,270
1898.....	84,554
1899 (first four months).....	29,239

According to the careful compilations of Mr. John Stanton the exports of fine copper during recent years have been as follows:

Exports of fine copper from the United States.

Year.	Quantity.
	<i>Long tons.</i>
1893.....	80,392
1894.....	77,527
1895.....	64,722
1896.....	125,605
1897.....	129,210
1898.....	145,115
1899 (first half).....	56,460

LAKE SUPERIOR MINES.

The following is, in detail, the output of the Lake Superior mines, as reported by the companies, from 1884 to 1891:

Production of Lake Superior copper mines, 1884 to 1891.

Mine.	1884.	1885.	1886.	1887.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>
Calumet and Hecla	40,473,585	47,247,990	50,518,222	46,016,123
Quincy	5,650,436	5,848,530	5,888,511	5,603,691
Osceola	4,247,630	1,945,208	3,560,786	3,574,972
Franklin	3,748,652	4,007,105	4,264,297	3,915,838
Allouez	1,928,174	2,170,476	1,725,463	885,010
Atlantic	3,163,585	3,582,633	3,503,670	3,641,865
Pewabic	227,834			
Central	1,446,747	2,157,408	2,512,886	2,199,133
Grand Portage	255,860			
Conglomerate	1,198,691			
Mass	481,396	363,500	247,179	
Copper Falls	891,168	1,150,538	1,378,679	719,150
Phoenix	631,004	344,355	1,101,804	11,000
Hancock	562,636	203,037	150,000	
Huron	1,927,660	2,271,163	1,992,695	1,881,760
Ridge	74,030	63,390	158,272	84,902
St. Clair	139,407			
Cliff	28,225		22,342	
Wolverine	751,763	328,610	3,125	2,300
Nonesuch	23,867	28,484		
Isle Royale	16,074			
National	87,368	162,252	184,706	25,187
Minnesota	1,144	12,608		
Belt	130,851	27,433	7,300	
Sheldon and Columbia ..	9,828			
Adventure	4,333	4,000	1,000	
Peninsula	1,225,981			
Tamarack		181,669	3,646,517	7,396,529
Ogima	1,106	12,000		
Kearsarge				21,237
Evergreen Bluff	954	1,500	1,000	
Ash Bed	1,517			
Sundry companies— tributers	21,696	34,000	50,000	50,000
Total	69,353,202	72,147,889	80,918,460	76,028,697

COPPER.

171

Production of Lake Superior copper mines, 1884 to 1891—Continued.

Mine.	1888.	1889.	1890.	1891.
	Pounds.	Pounds.	Pounds.	Pounds.
Calumet and Hecla	50,295,720	48,668,296	59,868,106	.....
Quincy	6,367,809	6,405,686	8,064,253	10,542,519
Osceola	4,134,320	4,534,127	5,294,792	6,543,358
Franklin	3,655,751	4,346,062	5,638,112	4,319,840
Allouez	314,198	1,762,816	1,407,828	1,241,423
Atlantic	6,974,877	3,698,837	3,619,972	3,653,671
Central	1,817,023	1,270,592	1,413,391	1,237,500
Mass .....	.....	58,349	62,187	.....
Copper Falls	1,199,950	1,440,000	1,330,000	1,427,000
Huron	2,370,857	2,219,473	1,736,777	1,257,059
Ridge	50,924	28,000	21,569	.....
National .....	.....	454,134	123,879	.....
Adventure .....	.....	692	15,485	.....
Peninsula .....	.....	736,507	1,108,660	1,599,670
Tamarack	11,411,325	10,605,451	10,106,741	16,161,312
Kearsarge	829,185	1,918,849	1,598,525	1,727,390
Evergreen Bluff .....	.....	21,580	.....	.....
Sundry companies—	.....	.....	.....	.....
tributers	50,000	6,224	.....	.....
Total	86,472,034	88,175,675	101,410,277	.....

The following table records only the output of some of the leading producers in that district:

Production of Lake Superior copper mines, 1892 to 1898.

Mine.	1892.	1893.	1894.
	Pounds.	Pounds.	Pounds.
Tamarack	16,426,633	15,085,113	15,375,281
Quincy	11,103,926	14,398,477	15,484,014
Osceola	7,098,656	6,715,870	6,918,502
Franklin	3,769,605	3,504,244	3,556,487
Atlantic	3,703,875	4,221,933	4,437,609
Kearsarge	1,467,758	1,627,030	1,998,710
Tamarack, Junior	796,769	1,610,259	2,349,329
Peninsula	973,217	.....	.....
Copper Falls	1,350,000	750,000	.....
Huron	461,499	562,776	.....
Allouez	546,530	.....	.....
Central	1,625,982	1,180,040	584,590
Centennial	106,801	.....	.....
Wolverine	500,074	1,025,062	1,665,255

Production of Lake Superior copper mines, 1892 to 1898—Continued.

Mine.	1895.	1896.	1897.	1898.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>
Tamarack	14,900,286	16,044,860	20,222,529	23,000,000
Quincy	16,304,721	16,863,477	16,924,618	16,354,061
Osceola	6,270,373	6,251,304	11,201,103	11,900,000
Kearsarge	1,946,163	1,377,226		
Tamarack, Jr.	2,605,000	2,135,000		
Franklin	3,086,933	2,746,076	2,908,284	2,623,702
Atlantic	4,832,497	4,895,985	5,109,663	4,377,399
Central	379,020	469,243	611,172	291,339
Wolverine	1,815,391	2,220,933	2,316,296	4,588,114

The Calumet and Hecla Company has further moderately increased its product during 1898, but has not added to equipment calculated to bring about an early enlargement of output. Developments on the Osceola load are being pressed forward. The production during the last fiscal year was 44,450 long tons, a decrease of 744 tons from the previous year.

The production of the Tamarack has continued to increase, having risen to 31,127,623 pounds of mineral in 1898, as compared with 29,589,380 pounds in 1897, and 23,628,899 pounds in 1896. A further increase is expected when the entire stamping outfit is working under improved conditions. During the year 812,983 tons of rock was hoisted, 76,868 tons coming from crosscuts, shafts, and winzes, and the balance from the lode. Of the total quantity 71,304 tons was hoisted from the oldest, No. 1, shaft, which is 3,240 feet deep; 430,262 tons from No. 2 shaft, 3,866 feet deep, and 311,417 tons from No. 3 shaft, 4,596 feet deep. The No. 4 shaft, 4,450 feet deep, is not equipped for hoisting rock, but may be later on. No. 5 shaft, which was started in the fall of 1895, is expected to strike the lode at a depth of about 4,600 feet, and since a depth of 3,000 feet was attained at the close of 1898 it will probably reach the deposit toward the fall of 1900. It is not likely that it will be in position for use for hoisting rock until well into 1901. The equipment will rank among the greatest mining machinery in the world, so that the construction account promises to be heavy for the next few years. The hoisting engine is now in place and a large compressor plant at No. 3 shaft has gone into commission. The company has completed a pumping plant on Lake Superior with a capacity of 1,000,000 gallons per twenty-four hours.

During the year 1898 the two stamp mills, with five and two stamps, respectively, had a running time equivalent to one head running two thousand and eighty-eight days, stamping 736,159 tons of Tamarack and Tamarack, Jr., rock, or 352.45 tons per day. Of this quantity

670,832 tons was Tamarack product, the cost of stamping being 22.402 cents per ton, while the total cost per ton of rock mined was \$1.66, and per ton of rock stamped \$2.01.

The gross receipts for 1898 were \$2,381,388.95, increased by the larger product, and also by an increase in the net price of copper of five-eighths cent per pound. The expenditures were \$1,862,507.02, which included \$36,897.48 for construction at shafts Nos. 3 and 4, \$100,363.50 for sinking and construction at No. 5, and \$63,030.64 for sundry construction. The net income for the year amounted to \$518,881.93, out of which dividends aggregating \$480,000 were paid.

The Quincy is continuing its active preparations for an increased production. A new shaft, No. 7, is being sunk from a number of points, the aggregate sinking having been 2,560 feet, and will be completed early in 1900. A large hoisting engine capable of taking 8,000 feet of 1½ rope has been ordered, and a contract has been let for a 60-drill Rand compressor. A new stamp mill, for which to begin with three stamps have been ordered, is expected to be ready when the production of No. 7 shaft will begin. The old mill has five heads of stamps, so that the capacity of the mine will be considerably enlarged. In the meantime, recently, the rock has temporarily not yielded as well, so that the output is not quite up to the former rate. The new smelting works at Hancock were completed in December. There are four furnaces, capable of treating 20 tons daily each.

The product of the mine in 1898 was 20,056,942 pounds of mineral, yielding 16,354,061 pounds of refined copper, for which there was realized the gross sum of \$1,986,116.81. The running expenses at the mine were \$887,886.35; the cost of construction, \$221,277.01; taxes in Michigan, \$35,989.20, and smelting, transportation, and all other expenses, \$191,385.67, leaving as mining profit, \$649,578.58. Interest and sales of real estate carried the income up to \$668,103.86, out of which dividends aggregating \$650,000 were paid.

The stamp mill crushed 543,592 tons of rock at a cost of 22.28 cents per ton, the product of mineral being 14,712,685 pounds, while the product of the rock houses was 5,344,257 pounds.

The following table shows the operations of the Quincy mine for a series of years. It illustrates well the steady increase in production, the fluctuations in the yield, the heavy decline in the price of copper, the crowding down of cost through improvements in spite of increasing depth, and the remarkable uniformity of wages paid. It should be stated that the average price realized is calculated from the gross income and the product, the reports failing to show the quantity of copper on hand at the beginning of each fiscal year, and the values at which it was put in.

MINERAL RESOURCES.

Operations of the Quincy mine.

Year.	Product.	Yield fine cop- per per fathom broken.	Price obtained.	Cost per pound, exclusive of con- struction.	Number of miners on con- tract.	Average monthly contract wages.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Cents.</i>	<i>Cents.</i>		
1864.....	2,498,574	562	44.8	26.7	242	\$65.50
1865.....	2,720,980	501	-----	-----	212	57.53
1866.....	2,114,220	451	31.3	29	227	53.16
1867.....	1,921,620	526	22.7	18.9	167	50.83
1868.....	1,417,941	447	25.2	23.1	157	50.44
1869.....	2,417,365	446	21.9	16.7	210	51.10
1870.....	2,496,774	528	21.5	15.3	181	46.09
1871 (a)	2,409,501	441	22.8	15.2	104	47.08
1872.....	2,269,104	391	32.5	22.9	233	60.62
1873.....	2,621,087	491	26.5	18.6	223	62.42
1874.....	3,050,154	577	21.9	15.1	234	43.38
1875.....	2,798,281	485	22.7	15.8	217	46.74
1876.....	3,073,171	507	20	15.7	227	47.13
1877.....	2,837,014	467	18.6	15.1	247	43.79
1878.....	2,991,050	395	14.9	14	234	41.50
1879.....	2,639,958	403	16.3	13.7	212	38.76
1880.....	3,609,250	563	18.5	11.8	192	49.10
1881.....	5,702,606	767	18.7	10	212	48.54
1882.....	5,682,663	800	17.1	9.5	152	43.83
1883.....	6,012,239	850	13.7	8.9	165	46.02
1884.....	5,680,087	722	12.2	8.6	157	43.35
1885.....	5,848,497	710	11.4	7.5	132	44.00
1886.....	5,888,517	638	11.1	6.8	140	45.80
1887.....	5,603,691	781	11.7	8.6	142	48.40
1888.....	6,367,809	690	15.9	10.1	158	49.60
1889.....	6,405,686	690	12	9.4	145	49.15
1890.....	8,064,253	769	15.7	8.2	146	52.60
1891.....	10,542,519	685	12.8	9.1	182	53.40
1892.....	11,103,926	572	11.27	8.8	238	53.75
1893.....	14,398,477	574	10.4	7.1	259	49.60
1894.....	15,484,014	584	9.5	5.7	285	50.70
1895.....	16,304,721	517	10.1	5.9	336	50.00
1896.....	16,863,477	477	10.9	6.5	379	52.00
1897.....	16,924,618	481	11.1	6.8	393	52.52
1898.....	16,354,061	513	12	6.8	381	52.50

a Introduction of steam drills.

The product of the Franklin mine in 1898 fell off because the old stamp mill was destroyed by fire at the end of November. The mine produced 3,300,511 pounds of mineral, including 807,950 pounds mass

and barrel work, yielding 2,623,702 pounds of fine copper, as compared with 2,908,284 pounds in 1897. There were hoisted 127,021 tons of rock, of which 47,235 tons came from the Franklin, jr., property, the amount of rock stamped being 116,696 tons, at a cost of 51.02 cents per ton. The percentage of mineral was 1.41 per cent, as compared with 1.358 per cent in 1897. The income was \$317,918 in 1898, against \$320,917.33 in 1897, while the costs were \$206,413 for mining and stamping and \$40,018 for smelting and freight, leaving a balance for 1898 of \$71,487, as compared with \$9,473 in 1897.

In April, 1898, the capitalization of the Franklin Mining Company was increased to \$1,000,000 from \$320,000, 40,000 shares of stock being sold for \$400,000. The old Franklin territory has been exhausted, except a portion of the north end, where there are still considerable reserves. The future of the company, however, depends upon the Franklin, Jr., formerly known as the Albany and Boston, and later as the Peninsular, on which the Pewabic lode has been energetically developed, being opened by four shafts. These have been equipped with modern hoisting engines and compressors and drills. A new mill, located on Grosse Point, on Portage Lake, is approaching completion. It will contain four Allis heads, capable of handling 1,500 tons of rock per day, so that the mine would apparently, with its quota of mass and barrel work, approach an annual production of 10,000,000 pounds. The total amount expended on the Franklin, jr., to the end of 1898 was \$522,330, the outlays in 1898 having been \$198,618 at the mines and \$97,275 at the stamp mill.

The production of the Atlantic mine fell considerably below that of the previous year, partly because the yield of the rock was the lowest on record, 11.8 pounds of copper to the ton of rock stamped, while the wages were the highest yet paid. A fire in one of the shafts, too, resulted in the loss of about one month's production. The mine produced in 1898 5,926,450 pounds of mineral, or 4,377,399 pounds of refined copper, as compared with 5,109,663 pounds in 1897. There was realized for the copper an average price of 11.83 cents, the total receipts being \$518,219.14 in 1898, as compared with \$574,783.65 in 1897. The mining expense was \$440,373.44, while the cost of smelting, freight, etc., footed up to \$59,479.27, thus leaving a surplus of \$18,366.43. There were paid out for construction at the mines, mill, and railroads, and for exploration, \$69,360.37, an excess of expenditures of \$51,236.04, reducing the surplus to \$105,098.87.

The following record of cost for a series of years shows how it has been possible by close management to treat an ore yielding less than 0.75 per cent of copper.

Cost of copper at the Atlantic mine per ton of rock treated.

Items of cost.	1888.	1889.	1890.	1891.	1892.	1893.
Mining, selecting, breaking, and all surface expenses, including taxes.	<i>Cents.</i> 83.73	<i>Cents.</i> 87.87	<i>Cents.</i> 104.14	<i>Cents.</i> 95.29	<i>Cents.</i> 83.98	<i>Cents.</i> 79.49
Transportation to mill....	3.47	3.88	3.46	3.86	3.33	3.28
Stamping and separating.	26.89	27.78	27.78	25.82	25.09	24.95
Freight, smelting, marketing, and New York expenses	21.42	20.22	20.37	18.47	17.67	18.22
Total working expenses	135.51	139.75	155.75	143.44	130.07	125.94
Total expenditures, including construction.....	142.82	153.27	166.70	154.51	133.51	160.24
Net profit	54.36	6.23	27.71	0.16	.....	.....
Yield of copper, per cent.	0.667	0.663	0.650	0.615	0.615	0.669

Items of cost.	1894.	1895.	1896.	1897.	1898.
Mining, selecting, breaking, and all surface expenses, including taxes	<i>Cents.</i> 75.18	<i>Cents.</i> 75.25	<i>Cents.</i> 76.43	<i>Cents.</i> 73.43	<i>Cents.</i> 89.11
Transportation to mill.....	3.03	4.08	4.96	4.54	5.55
Stamping and separating ...	23.30	22.20	24.87	23.94	24.11
Freight, smelting, marketing, and New York expenses	17.71	18.81	17.47	17.03	16.04
Total working expenses.	119.22	120.34	123.73	118.94	134.81
Total expenditures, including construction .	165.07	156.05	135.99	129.69	153.59
Yield of copper, per cent ...	0.703	0.730	0.660	0.648	0.59

The Osceola Consolidated, which includes the former Kearsarge and Tamarack, Jr., properties, produced, in 1898, 15,848,928 pounds of mineral, as compared with 13,857,373 pounds, the mineral yielding about 81.5 per cent of fine copper. The gross receipts in 1898 were \$1,549,820.12, as compared with \$1,338,056.11 in 1897, while the costs increased from \$1,075,655.03 to \$1,178,028.22. The net income in 1898 was \$371,791.90, as compared with \$262,401.08 in 1897. In 1898 dividends aggregating \$277,250 were paid, leaving a surplus of \$94,541.90. It appears that 2,000 out of the 9,000 shares of treasury stock have been

sold, netting \$114,109.85, out of which \$29,140.67 was expended on account of the new stamp mill.

W. E. Parnall, the superintendent, reports that the total quantity of rock mined was 637,603 tons, of which 505,008 tons was stamped at a cost of 28.94 cents per ton. At the Osceola branch a new hoisting outfit, capable of handling 1,500 to 1,800 tons of rock, is in working order at one shaft, and a duplicate is to be installed at another shaft. On the Kearsarge branch a new shaft is being sunk. An important piece of work, which will add to the production of the company, is the approaching completion of a new stamp mill with three heads, with 20 by 24 inch cylinders. Some interesting modifications in handling the rock are to be introduced, which will also be adopted at the old mill of six stamps. It is estimated that the combined capacity of the plants will be equal to about 3,500 tons of rock per day, which at the same yield would represent an annual production of fully 25,000,000 pounds.

The Baltic is one of the new mines which is expected to contribute a moderate amount of copper during 1899, having the use of one of the stamps of the Atlantic mill. The Baltic belt is regarded as being probably the most easterly of the copper-bearing amygdaloids. The work of exploration and development has been actively prosecuted during 1898, the expenditures having aggregated \$129,406.86.

The Allouez has been sinking and prospecting on the Osceola lode, and purchased from the St. Mary's Canal Mineral Land Company 40 acres of land on which it outcropped. A shaft has been sunk, but copper has not yet been found in paying quantities. Explorations have also been made for the Quincy Pewabic lode. The company leased one head of its stamp mill to the Wolverine Company.

The Central, which was organized in 1854 with a capital stock paid in of \$100,000, and which paid during its career \$1,970,000 in dividends, practically stopped work in 1898, producing in that year 291,339 pounds of copper at a loss of \$23,931.16, and reducing its net surplus to \$6,866.73. The company owns a large territory and explorations on contiguous lands may help discoveries of mines of value in the future.

There has been a very great activity in promoting new companies to reopen old mines and explore and develop mineral property on the Lake Superior copper range. These may be divided into four groups, the principal one being along the stretch of territory between Hancock and north of Calumet, on which there are now, proceeding northeast, the producing mines Quincy, Franklin, Osceola, Calumet and Hecla, Tamarack, Wolverine, and Kearsarge. Located in this territory are the new companies, the Arcadian, Rhode Island, Tecumseh, Old Colony, Mayflower, Mohawk, and Seneca.

A second group is that of Keweenaw County, beginning at Eagle River, with the Phoenix, Meadow, Humboldt, Arnold, Conglomerate, and Washington, the Central having been the most famous producer. A

third group is that directly south of Houghton, where the Atlantic has been the steadiest producer. This includes the Baltic, south of the Atlantic, the Tri-Mountain adjoining it, the Miners, and Isle Royale. The fourth is the Ontonagon County group of mines, with Rockland as the central point. Farthest north, nearest the Atlantic group there is the Winona, Wyandotte, and Kaukauna, Elm River, and in order, passing southwest, the Belt, Adventure, Evergreen, the Michigan (formerly the Minnesota), Washington, and Victoria.

In nearly all the cases in which reopening or development have been undertaken large sums of money have been covered into the treasuries of the companies at the time of flotation. In many cases these sums, while ample for the preliminary work, must be supplemented with a large capital outlay, if developments are shown to justify the erection of permanent machinery and stamping facilities. So far as the near future is concerned, only a few will figure as producers either in 1899 or in 1900. In the case of the Ontonagon group an important feature is the prospect of an early improvement in railroad facilities through the building of the Copper Range Railroad between Greenland and Houghton.

By far the most important of the new companies, from the standpoint of an early accession to the lists of copper producers, is the Arcadian Copper Company, which controls the lands northeast of the Quincy once belonging to the Arcadian, Douglas, Concord, and Edwards. The Isle Royale amygdaloid belt has been developed by four shafts equipped with modern machinery, and a very extensive blocking out of ground has been carried through.

At Grosse Point a mill with three heads of stamps has been erected, whose capacity is estimated at 1,500 tons of rock per day. As yet it is of course impossible to judge with any degree of accuracy what the annual product, running to full capacity, is likely to be.

Aside from the Arcadian and the Baltic companies no contributions to the supply of any consequence are expected in 1899. It is likely, however, that in 1900 an additional number of properties will enter the ranks of producers.

MONTANA.

During 1898 the production of copper in Montana showed some decline, due chiefly to the Anaconda, whose operations were hampered. As in past years, the Anaconda reports shipments rather than product, and these have shown a sharp decline. The compilation of the statistics for the Butte district call for special care, since some of the companies work ores and mattes for others, and one of them has also handled British Columbia mattes. The danger of duplication is therefore great, and is guarded against by special reports from the different concerns specially bearing on this point.

The growth in importance of Montana as a copper producer is shown in the following table:

Montana's proportion of the copper product.

Year.	United States.	Montana.		Lake Superior
	Pounds.	Pounds.	Per cent.	Per cent.
1882.....	90,646,232	9,058,284	10.0	62.9
1883.....	115,526,053	24,664,346	21.4	51.6
1884.....	144,946,653	43,093,054	29.7	47.8
1885.....	165,875,483	67,797,864	40.9	43.5
1886.....	157,763,043	57,611,621	36.7	51.6
1887.....	181,477,331	78,699,677	43.4	41.9
1888.....	226,361,466	97,897,968	43.3	38.2
1889.....	226,775,962	98,222,444	43.3	38.9
1890.....	259,763,092	112,980,896	43.5	39.0
1891.....	281,121,764	112,063,320	39.4	40.2
1892.....	344,998,679	163,206,128	47.3	35.7
1893.....	329,354,398	155,209,133	47.1	34.2
1894.....	354,188,374	183,072,756	51.6	32.3
1895.....	380,613,404	190,172,150	50.0	34.0
1896.....	460,061,430	221,918,179	48.2	31.2
1897.....	494,078,374	230,288,141	46.6	29.4
1898.....	526,512,987	206,173,157	39.2	30.1

The production of the Butte district has been falling off, and some of the mines at greater depth have suffered from a steady decline in the copper contents of the ore bodies, until some of them are treating ore as low as 2½ to 3 per cent in copper. Still large new bodies have been opened in more recently worked claims. Some of them are not available for immediate production, since they are tied up by litigation, while others are held in reserve. The opinion is gaining ground in the copper industry that Butte is approaching its maximum and that no notable further increase in output can be expected without elaborate additions to concentrating and smelting equipment.

The annual report of the Anaconda Copper Mining Company for the fiscal year ending June 30, 1899, has not been issued, so that the latest official information is not available.

The gross receipts of the Boston and Montana Company during the calendar year 1898 were \$7,448,600.26 as compared with \$6,949,097.23 in 1897. The costs at the mines and smelters increased from \$3,274,579.87 in 1897 to \$3,354,171.99 in 1898, while the expenses of handling copper, such as freight, copper charges, commissions, etc., grew from \$658,080.38 in 1897 to \$699,785.15 in 1898, leaving the net income for 1898 \$3,394,643.12 as compared with \$3,016,436.98 in 1897. In 1898 the company made a profit of \$113,743.28 on treating custom and lease ore.

The net interest payments and the amount assigned to the sinking fund amounted to \$76,542.64, thus leaving as the amount applicable to dividends in 1898 \$3,431,843.76 as compared with \$2,882,998.97 in 1897. The dividends paid amounted to \$2,400,000 in 1898 as compared with \$1,800,000 in 1897.

Frank Klepetko, the superintendent, reports that the slight increase in the cost of mining is explained by the larger expense of development work, which has increased the ore reserves approximately 860,000 tons. The work of substituting the latest types of equipment at the Great Falls smelting works has been continued and two new blast furnaces have been completed, and the new reverberatory is working successfully. Additions and changes have been made in the concentrating plant, and the electrolytic plant has been carried up to a capacity of 4,000,000 pounds per month. The improvements made, while they did not favorably influence costs in 1898, are expected to lead to lowering them in 1899. An actual increase in the productive capacity of the mines can not be said to have taken place.

The Montana Ore Purchasing Company has acquired additional mining properties and has been actively developing them. With an increased ore supply additions to the smelting plant have become necessary, the concentrating works having an adequate capacity. The work is now proceeding of putting up twenty additional rotary calciners, two reverberatory furnaces, and a converter stand, the whole to be completed in August. This will greatly increase the capacity, adding about 8,000,000 pounds of copper per annum.

The Butte and Boston Company has erected a converting plant, the smelting works being leased to the Boston and Montana Company. It is estimated that the Butte and Boston Company will soon be in a position to produce monthly from 800,000 to 900,000 pounds fine copper.

Developments have continued in the Washoe property, which includes the Moonlight, Pacific, Poland, and other claims in the Butte district. Report has it that large bodies of ore have been developed.

The Parrot has been falling off in output of copper, and its new smelting plant has not yet been put in commission.

ARIZONA.

Arizona has the record of having made the greatest increase in the output in 1898, continuing the steady progress made for a number of years. All the leading producers have contributed to that increase and are making further arrangements for expansion of output. It is probable that Arizona will witness the largest additions to production during the current year and that a number of new properties will reach the producing stage. There has been a very widespread effort to prospect and develop the copper resources, and while the actual increase from this source does not promise to be of importance in 1899, it is probable that 1900 will witness some accessions to the ranks of contributors to the copper supply.

The Copper Queen is sinking a new shaft to reach the present distant workings to better advantage, and is putting in a fourth converter. It is estimated that the added facilities will increase the annual output by 3,500,000 to 3,750,000 pounds.

In the Clifton district the Detroit Company is expanding by putting in a converter plant, and is expected to increase its output by 3,000,000 to 4,000,000 pounds.

The annual report of the Arizona Copper Company for the fiscal year ending September 30, 1898, shows gross profits of £175,791, from which is deducted for interest on different series of debentures £26,782 and other small items, leaving free profits of £149,100. After providing for a sinking fund for the debentures to the extent of £37,252 and carrying to reserve and to Clifton improvement fund £14,000, a surplus of £97,757 was available. Dividends aggregating £45,194 were paid on A preference shares and £35,894 on common stock. The Arizona Copper Company has been increasing its facilities and is enlarging production by about 3,000,000 pounds annually.

A new company, called the Arizona Copper Syndicate, Limited, has been formed in London to work a number of claims in the Clifton district, but no definite information is available.

In the Globe district the Old Dominion Copper Company will again become an important factor, although for some time to come 12,000,000 pounds per annum is likely to be its maximum. The United Globe Company will also contribute some more copper than in the past. A railroad 16 miles long is being built to the Centennial group as a preliminary to more extensive development, this property having been lately acquired by the Old Dominion Copper Mining and Smelting Company. The Black Warrior Copper Company shipped about 700 tons of 14 per cent ore early in 1898 from their mines, about 12 miles west of Globe. The company is now building a crushing plant of a rated capacity of 100 tons per day, with a reverberatory furnace for producing matte.

In the Verde district the United Verde Company has made additions to plant in 1898, and has now reached an output of about 5,000,000 pounds in a month, so that there will be an increase of fully 10,000,000 pounds in 1899 over the production of 1898.

In the same district very promising developments have been made by the Jerome Copper Company, of which Mr. Ralph Dillon, of Jerome, is managing director. The company is a private enterprise in which English and Scotch capital is interested. Since the property has passed into the hands of the company a deep working tunnel has been started, and at the close of May had progressed 650 feet; 300 feet was still to be driven before the known ore bodies are reached. At 540 feet the tunnel penetrated a promising 18-foot ore body not shown on the surface. It is not the purpose to erect a smelting plant, since the planned deep development and blocking out will require considerable time. Some other companies are endeavoring to open out properties in the Verde district.

A large number of enterprises are being undertaken in different parts of Arizona, of which some are likely to add to the copper product. Lombard, Goode & Co., of New York, have opened a new copper district north of Williams and have been developing a group of mines carrying carbonates and some sulphurets. Work has begun on a railroad from Williams to the mines, a distance of 45 miles, which is to be completed in October. A smelting plant has been erected at Williams with an equipment for two 100-ton stacks, one of the latter being erected.

The Helvetia Copper Company, organized in Boston, has purchased properties on which considerable development has been done, the ore being shipped to the Rosemont smelter. It is proposed to connect the property with the railroad and to build a smelter with a capacity of 100 tons of ore per day, to be completed in October of the current year.

An English enterprise is the Ray Copper Mines, Limited, with a capital of £260,000, to handle a series of claims on Mineral Creek, near Riverside, Pinal County.

A smelting plant is being delivered for the Table Mountain Copper Company, in Cochise County.

Production has begun by two new concerns, the Azurite Gold and Copper Mining Company and the Nielsen Mining and Smelting Company, both with headquarters at Tucson. The latter made a small amount of copper in 1898.

The Markeen Copper Company has been organized to develop a number of claims in the Greenlee Gold Mountain mining district, near Clifton. The company has no reduction plant as yet.

UTAH.

One of the most important recent additions to the list of copper producers is the Highland Boy mine of the Utah Consolidated Company, which began shipments in the middle of the current year. The company mines from a large deposit at Bingham, Utah, having established its smelting plant at Murray, on the Jordan River. The works consist of three Wethey roasting furnaces, three reverberatory furnaces, and two converters, the rated capacity being 250 tons of ore per day, which is to be doubled. The ore carries precious metals, and, running full, the plant is expected to produce close to 1,000,000 pounds of copper per month.

In the same district are the properties of the Boston Consolidated Company and the Bingham Copper and Gold Mining Company of Boston. The latter is now driving a tunnel to strike the vein, already opened extensively, at a depth 300 feet vertically below its present crosscut.

IDAHO.

For a number of years the Seven Devils district in Idaho has been regarded by many as likely to furnish a large supply of copper, but its

distance from railroad connections made the work of development costly and difficult, there being only two wagon roads, each about 100 miles long, one via Weiser to the Oregon Short Line and the other via Pine, Oregon, to Baker, on the Oregon Railway and Navigation Company. Two railroad lines are now under construction, one being the Pacific and Idaho Northern from Weiser, Idaho, to be completed this year, and the other the Northwest Railroad Company from Huntington, Oregon.

The largest mines in the district so far are the Peacock and the Iron Dyke, both under bond to the Northwest Copper Company. The former is in the Seven Devils district proper, while the latter is on Snake River, near Ballards Landing, some 20 miles south of the Peacock. At the former a shaft is being sunk, while the latter is being opened by tunnels. Both show large reserves of ore, but none is being taken out now. There is a 50-ton experimental smelting plant, which, however, has only made one run pending the completion of railroad connections. Another property which is being developed by deep tunnel is the Blue Jacket, bonded to F. J. French, of Cuprum. This property marketed some ore in 1898.

In Boston the Boston and Seven Devils Copper Company has been formed by parties identified with the Pacific and Idaho Northern Railroad to develop a series of twenty claims and to provide smelter facilities.

Beals & Whittle, mining engineers, of Boston, Mass., have favored this office with the following sketch of the Seven Devils district:

The Seven Devils copper district is situated in Washington and Idaho counties, State of Idaho, and is located about 5 miles east of the Snake River, and approximately 100 miles north of Weiser, Idaho. The region was named after a group of jagged peaks, situated on the north side of Deep Creek, which flows northwestward along the northern end of the copper district. The Seven Devils form the southwestern part of a high range of mountains extending to Buffalo Hump on the northeast and includes the Florence and Saw Tooth mountains.

In general the copper mines have an elevation ranging from 4,000 to 8,000 feet above the sea and from 2,000 to 6,000 feet above the Snake River at Ballards Landing. From the east the approach to the district is through a somewhat broken but rolling country, but on all other sides the district is surrounded by deep, steep-sided gulches, which characterize the Lower Snake country.

At the close of the Tertiary basalt flows the Seven Devils Mountains and the main part of the copper district projected as rugged islands well above the resulting lava plain. Since that time the Snake River and many of its lateral streams have cut down and uncovered the old prelava flow topography, and in part stripped off the basalt from the region lying close to the copper district, so that to-day, while most of the valleys are cut below the lava, the radiating buttresses are often capped with basalt. The old river systems of early Tertiary time had developed a topography of strong relief in a region characterized

by a terrane of fine-grained quartz porphyries. These porphyries to-day present all phases between thoroughly massive rocks and well-laminated schists. Associated with them there are scattered areas of well-crystallized marble.

Before the advent of the basalt flows and after the regional shearing which laminated the porphyries these rocks were penetrated by immense bases and dikes of coarse quartz-diorite, and it is at the contact between the diorite and the marble and the diorite and porphyry that the copper deposits of the Seven Devils district occur. Many apophyses of the diorite are sent into the older rocks, giving contact deposits in nearly all instances observed. These contact deposits or veins present some peculiarities, not only as regards their size, but as regards composition. The great bulk of the gangue minerals is iron garnet, often well crystallized but more frequently massive, particularly in the southern part of the district near the Alaska Saddle. Epidote is also a prominent gangue mineral throughout the copper district, and there are lesser amounts of quartz, calcite, compact granular magnetite, tabular hematite, and rarely molybdenite.¹ The character of the vein minerals is the same whether the diorite is in contact with marble or with porphyry. The veins themselves vary in width up to nearly 100 feet.

The associated copper minerals in the workings thus far made (say, 120 feet in depth), in the order of their prominence, beginning with the most common, are: Bornite, chalcocite, copper pyrite, chrysocolla, malachite, brochantite, cuprite, and native copper. Gold and silver in variable amounts also occur with the copper minerals. It is likely that most of these copper minerals will disappear below the oxidized zone and give place to copper pyrite.

It is a remarkable fact that the garnet-epidote veins have sharp lines of demarcation separating them from the diorite on the one hand and from the marble on the other. If the veins are the result of contact metamorphism, a transition of the garnets and epidotes into the lime would be expected, but only in a few cases were garnets noted occurring isolated in the marble. The vein matter and its included ores behaves in most instances like molten rocks injected along the contacts and locally sending out massive apophyses in great profusion into the neighboring marble.

This district is well supplied with power, which may be obtained from the rapid-running streams known as Indian and Deep creeks. If necessary, electrical power in unlimited quantities may also be generated on the Snake River and transmitted to the mining district. The completion of the Pacific and Idaho Northern Railroad from Weiser, Idaho, on the Oregon Short Line Railroad, to Cuprum and Helena, Idaho, will supply the district with the necessary mining timber, obtaining it along the route and at the mines. Coal fuel and coke will have to be transported from Wyoming, Colorado, or from northern Washington.

¹ Powellite was first described from the Peacock Mine in this district.

NEW MEXICO.

The copper product of this Territory has come chiefly from the Silver City Reduction Works. Preparations are being made to increase the capacity of the plant one half. The Santa Rita property is reported to have passed into the hands of parties identified with the Standard Oil Company. The Santa Fe Copper and Gold Mining Company now owns the San Pedro grant, the copper mines of which have been worked in the past. The new company is controlled by Lewisohn Brothers, A. S. Bigelow, and others, and will be actively developed. It did not produce any copper in 1898, nor is it likely to add to the metal supply during the current year.

NEVADA.

A good deal of activity is being displayed in this State. One of the new producers is the Adelaide Star Mines, Limited, owning the Adelaide mine, near Golconda, Nevada, and the Copper Canyon and the Copper Basin groups of mines, in the Battle Mountain mining district, whose ores are shipped to the smelting plant at Golconda. At the latter place there is a concentrating mill, two roasting furnaces, and three reverberating furnaces, with a capacity of 150,000 pounds of copper per month in matte.

At Reno, Nevada, is the plant of the Electric Mining and Reduction Company, which was expected to start in June. It consists of one wet battery of eight stamps, one dry battery of ten stamps, four large amalgamating and four leaching pans, a Howell roasting furnace of about 75 tons capacity, a 70-ton electric smelting furnace, and a 75-ton electric ore-roasting furnace. The mill, which is situated on the Truckee River, is operated by a 72-inch Leffel wheel.

The Vulcan Copper Mining and Smelting Company, of which Joseph Siegel, of Chicago, is president, is developing mines in the vicinity of Sodaville. A smelting plant has been ordered and its erection is planned for the fall, the capacity being 50 tons per day.

CALIFORNIA.

The increase in the production in this State during 1898 has been due entirely to the enlarging of operations on the part of the Mountain Copper Company, Limited, at Keswick, Shasta County. The annual report for the calendar year 1898 shows that there were mined 221,895 tons of ore, averaging 8.42 per cent of copper, as compared with 165,060 tons, averaging 8.56 per cent, in 1897. The smelting works treated 168,541 tons of ore, yielding 10,721 tons of matte, as compared with 97,185 tons in 1897, yielding 7,238 tons of matte. The quantity of fine copper marketed rose from 6,025 tons in 1897 to 8,273 tons in 1898. The net profit was £163,235 in 1898, as compared with £63,145 in 1897. After paying dividends aggregating £93,750, or at the rate of 7½ per cent, £70,000 was placed to the credit of reserve and depreciation.

The Ivanpah Copper Company during 1899 began the shipment of copper at the rate of about one carload per week, and the California Copper Company has erected a smelting plant at Madera.

An English company, the Copper King, Limited, has been formed with a capital of £350,000, to work mines 27 miles from Fresno, and is reported to be planning the erection of a smelting plant.

TENNESSEE.

Under the auspices of Lewisohn Brothers, of New York, the Tennessee Copper Company has been formed, which has acquired by purchase the properties of the Ducktown Sulphur, Copper, and Iron Company, the Loudon, and the Burra-Burra companies. Preparations are being made to work these Ducktown deposits on a large and comprehensive scale, and an important modern smelting works is to be built. It is not likely, however, that these plans will be carried to the point of largely adding to current product until well into 1900. It is estimated that when completed the product will be about 12,000,000 pounds annually. The Pittsburgh and Tennessee Company continues as an independent organization.

NORTH CAROLINA.

For two years W. E. C. Eustis, of Boston, has been doing development work in North Carolina, just over the Virginia line. Thus far the operations have been confined to sorting out the better grades of ore and shipping them, a haul by team of 4 miles to the railroad station at Virgilina being necessary. A spur track to the mine from the Atlantic and Danville Railroad is being built. The ores are a rich sulphide, containing a good deal of mineral as rich as glance, occurring in quartz and quartzite. Being highly siliceous, it is proposed to smelt them at a plant completed recently at West Norfolk, Va., with the cinder from roasting Canadian pyrites to supply the necessary iron.

The Union Copper Company has been organized to develop mining property near Gold Hill. Some shipments of ore have been made and a smelting plant has been ordered.

VERMONT.

There has been considerable activity in the old mines of Vermont, which were once an important source of copper. The Union and Corinth mines have changed hands. At the old Ely, now called the Copperfield, experimental work has been done with a Garrettson furnace on material taken from the dumps. The Elizabeth mine, at Strafford, is preparing the stopes, the best ore being shipped to a tide-water smelting plant, while the great mass of the ore extracted is being put on roast heaps. It is expected that the mine will begin shipping copper and copper matte in the fall.

A very important addition to the copper-refining capacity of the country has been made in the form of the Raritan Copper Works at Perth Amboy, N. J. It is the largest electrolytic plant in the country and treats not alone domestic, but also foreign raw material. Shipments are now on the way from England of Mount Lyell, Tasmania, converter material which is to be treated at this plant.

IMPORTS.

The imports of fine copper contained in ores, and of regulus and black copper, and of ingot copper, old copper, plates not rolled, rolled plates, sheathing metal, and manufactures not otherwise specified, and of brass are given in the following tables:

Fine copper contained in ores, and regulus and black copper imported and entered for consumption in the United States, 1867 to 1898, inclusive.

Year ending—	Fine copper contained in ores.		Regulus and black copper. (a)		Total value.
	Quantity.	Value.	Quantity.	Value.	
	Pounds.		Pounds.		
June 30, 1867.....		\$936, 271			\$936, 271
1868.....	3, 496, 994	197, 203			197, 203
1869.....	24, 960, 604	448, 487			448, 487
1870.....	1, 936, 875	134, 736			134, 736
1871.....	411, 315	42, 453	499	\$60	42, 513
1872.....	584, 878	69, 017	4, 247	1, 083	70, 100
1873.....	702, 086	80, 132	1, 444, 239	279, 631	359, 763
1874.....	606, 266	70, 633	28, 880	5, 397	76, 030
1875.....	1, 337, 104	161, 903	12, 518	2, 076	163, 979
1876.....	538, 972	68, 922	8, 584	1, 613	70, 535
1877.....	76, 637	9, 756	1, 874	260	10, 016
1878.....	87, 039	11, 785			11, 785
1879.....	51, 969	6, 199			6, 199
1880.....	1, 165, 283	173, 712	2, 201, 394	337, 163	510, 875
1881.....	1, 077, 217	124, 477	402, 640	51, 633	176, 110
1882.....	1, 473, 109	147, 416	224, 052	30, 013	177, 429
1883.....	1, 115, 386	113, 349			113, 349
1884.....	2, 204, 070	219, 957	2, 036	204	220, 161
1885.....	3, 665, 739	343, 793	285, 322	20, 807	364, 600
Dec. 31, 1886.....	4, 503, 400	341, 558	1, 960	98	341, 656
1887.....	3, 886, 192	194, 785	27, 650	1, 366	196, 151
1888.....	4, 859, 812	381, 477	4, 971	324	381, 801
1889.....	3, 772, 838	274, 649	60, 525	4, 244	278, 893
1890.....	3, 448, 237	241, 732	221, 838	15, 688	257, 420
1891.....	8, 931, 554	774, 057	2, 403, 919	214, 877	988, 934
1892.....	7, 669, 978	453, 474	303, 087	17, 390	470, 864
1893.....	7, 256, 015	435, 448	3, 175, 559	202, 197	637, 645
1894.....	4, 804, 614	260, 402	5, 873, 820	144, 832	405, 234
1895.....	b 8, 921, 920	213, 689	b 3, 104, 640	125, 853	339, 542
1896.....	b 2, 620, 800	126, 580	b 3, 427, 200	210, 725	337, 305
1897.....	b 43, 919, 680	683, 497	2, 974, 720	226, 704	910, 201
1898.....	b 107, 253, 440	565, 245	1, 583, 680	92, 135	657, 380

a Not enumerated until 1871.

b Ores.

Copper imported and entered for consumption in the United States, 1867 to 1898, inclusive.

Year ending—	Bars, ingots, and pigs.		Old, fit only for remanufacture.		Old, taken from bottoms of American ships abroad. (a)	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	<i>Pounds.</i>		<i>Pounds.</i>		<i>Pounds.</i>	
June 30, 1867...	1,635,953	\$287,831	569,732	\$81,930	.....	.....
1868...	61,394	6,935	318,705	42,652	.....	.....
1869...	13,212	2,143	290,780	34,820	.....	.....
1870...	5,157	418	255,386	31,931	.....	.....
1871...	3,316	491	369,634	45,672	.....	.....
1872...	2,638,589	578,965	1,144,142	178,536	.....	.....
1873...	9,697,608	1,984,122	1,413,010	255,711	32,307	\$4,913
1874...	713,935	134,326	733,326	137,087	9,500	930
1875...	58,475	10,741	396,320	55,564	11,636	1,124
1876...	5,281	788	239,987	35,545	10,304	1,981
1877...	230	30	219,443	28,608	41,482	5,136
1878...	1	1	198,749	25,585	.....	6,004
1879...	2,515	352	112,642	11,997	11,000	1,107
1880...	1,242,103	206,121	695,255	91,234	.....	.....
1881...	219,802	36,168	541,074	63,383	14,680	1,504
1882...	6,200	836	508,901	59,629	16,075	1,629
1883...	.....	.....	330,495	36,166	9,415	666
1884...	b 542	107	149,701	12,099	.....	554
1885...	914	172	81,312	6,658	.....	1,160
Dec. 31, 1886...	276	37	37,149	2,407	.....	584
1887...	212	22	39,957	2,374	.....	120
1888...	1,787	299	37,620	2,535	.....	.....
1889...	3,160	522	19,912	1,176	.....	.....
1890...	5,189	859	284,789	26,473	.....	.....
1891...	2,556	389	134,407	9,685	.....	.....
1892...	22,097	2,588	71,485	6,114	.....	.....
1893...	554,348	58,480	59,375	6,945	.....	6,326
1894...	606,415	42,688	160,592	15,726	.....	1,143
1895...	7,979,322	726,347	1,336,901	109,340	.....	.....
1896...	9,074,379	750,976	2,422,554	196,419	.....	.....
1897...	12,646,552	1,142,526	1,780,390	158,829	.....	.....
1898...	35,892,944	3,094,541	1,986,133	168,405	.....	.....

a Not enumerated until 1873.

b Includes "plates not rolled" since 1884.

COPPER.

189

Copper imported and entered for consumption in the United States, etc.—Continued.

Year ending—	Plates not rolled.		Plates rolled, sheets, pipes, etc.	
	Quantity.	Value.	Quantity.	Value.
	<i>Pounds.</i>		<i>Pounds.</i>	
June 30, 1867.....				\$1, 101
1868.....				1
1869.....				39
1870.....				2, 039
1871.....	430	\$129		7, 487
1872.....	148, 192	33, 770		18, 895
1873.....	550, 431	97, 888		4, 514
1874.....				27
1875.....	8	4		617
1876.....	5, 467	600		326
1877.....				203
1878.....				1, 201
1879.....	27, 074	4, 496		786
1880.....	120	11		4, 134
1881.....	20	3		82
1882.....			5, 855	1, 551
1883.....			2, 842	379
1884.....			6, 529	2, 330
1885.....			470	120
Dec. 31, 1886.....			3, 770	339
1887.....			37, 925	5, 493
1888.....			5, 208	737
1889.....			13, 848	2, 082
1890.....			4, 209	917
1891.....			122, 219	23, 291
1892.....			1, 788	600
1893.....			7, 056	1, 065
1894.....			12, 681	1, 821
1895.....			27, 156	2, 586
1896.....			34, 481	4, 834
1897.....			3, 116	430
1898.....			11, 793	2, 193

MINERAL RESOURCES.

Copper imported and entered for consumption in the United States, etc.—Continued.

Year ending—	Sheathing metal, in part copper. (a)		Manufactures not otherwise specified.	Total value.
	Quantity.	Value.	Value.	
	<i>Pounds.</i>			
June 30, 1867.....	220,889	\$37,717	\$15,986	\$424,565
1868.....	101,488	18,852	21,492	89,932
1869.....	43,660	6,592	43,212	86,806
1870.....			483,220	519,608
1871.....			668,894	722,673
1872.....			1,007,744	1,817,910
1873.....			869,281	3,216,429
1874.....	282,406	50,174	125,708	448,252
1875.....	136,055	23,650	35,572	127,272
1876.....	18,014	2,903	29,806	71,949
1877.....	110	22	41,762	75,761
1878.....	647	55	35,473	68,319
1879.....	300	20	39,277	58,035
1880.....	6,044	693	130,329	432,522
1881.....	39,520	4,669	284,509	390,318
1882.....			77,727	141,372
1883.....	6,791	1,047	40,343	78,601
1884.....	19,637	926	55,274	71,290
1885.....	86,619	9,894	61,028	79,027
Dec. 31, 1886.....	21,573	1,917	31,871	37,155
1887.....	18,189	1,867	37,289	47,174
1888.....	23,622	2,696	14,567	20,834
1889.....	23,520	2,572	13,430	19,782
1890.....	37,458	4,467	24,752	57,468
1891.....	228,486	29,112	12,926	75,403
1892.....	417,134	51,380	49,764	110,446
1893.....	1,670	167	16,166	89,149
1894.....	8,422	1,470	3,351	66,699
1895.....	5,698	389	13,166	851,828
1896.....	3,183	303	20,953	973,485
1897.....	15,282	1,929	30,729	1,334,443
1898.....	5,801	679	620,071	3,285,889

a Does not include copper sheathing in 1867, 1868, and 1869.

b Including wire.

COPPER.

191

The source of the imports of fine copper in ore into the United States during 1893 and 1894 is shown in the following table. For 1895, 1896, 1897, and 1898 the tonnage of material is given:

Imports of fine copper in ore in 1893, 1894, 1895, 1896, 1897, and 1898.

Countries from which imported.	1893.		1894.	
	Quantity.	Value.	Quantity.	Value.
	<i>Pounds.</i>		<i>Pounds.</i>	
Spain	166,870	\$11,680		
Dominion of Canada:				
• Nova Scotia, New Brunswick, etc	1,344	48		
Quebec, Ontario	4,795,704	307,000	4,599,505	\$342,790
British Columbia	7,790	778	78,380	7,838
Newfoundland and Labrador	1,788,261	91,099	2,028,261	113,931
Mexico	639,606	41,201	303,782	18,356
Venezuela	257,112	12,570	236,750	11,099
All other countries	66,700	3,612	a 4,479	408
Total	7,723,387	467,988	7,251,157	494,422

Countries from which imported.	1895 (ore and regulus).		1896 (ore and regulus).		1897 (ore and matte).		1898 (ore and matte).	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	<i>Tons.</i>		<i>Tons.</i>		<i>Tons.</i>		<i>Tons.</i>	
Germany					10	\$2,125	30	\$6,452
Dominion of Canada:								
Quebec, Ontario ..	1,168	\$72,099	529	\$22,638	243	24,191	625	89,571
British Columbia ..	1,135	117,888	1,031	43,302	3,453	714,078	1,859	478,227
Newfoundland and Labrador ...	5,467	15,510						
Mexico	1,853	198,171			1,562	76,072	475	67,226
All other countries ..	11	771	1,171	282,689	5	124	72	12,779
Total	9,634	404,439	2,731	348,629	5,273	816,590	3,061	654,355

a All from Peru.

For the year 1893 the above table includes 467,372 pounds which were either reexported or entered in bonded warehouses and not withdrawn during 1893, so that the actual amount of imported fine copper contained in ores consumed in the United States in 1893 was 7,256,015 pounds.

With the general introduction of Bessemerizing the movement of matte promises to become more and more restricted to low-grade mattes

obtained as a by-product in lead smelting. Early in the year a certain quantity of British Columbia matte was handled at Butte, but since then this has ceased. During 1898, however, the plant of the Le Roi Mining and Smelting Company, at Northport, Wash., has gone into operation, treating British Columbia material, 97½ per cent thereof coming from the Le Roi mine. The returns from two plants account for 3,556,251 pounds of fine copper, so that an estimate of 3,750,000 pounds as the fine copper contents of ores and mattes imported is justified.

One source of imported copper is wholly neglected by the Bureau of Statistics, to judge from the details submitted, and that is the metal contained in the nickel mattes from the Sudbury district. The quantity thus brought into this country for 1897 was estimated at 6,150,000 pounds. In 1898 it rose to about 9,000,000 pounds.

Another source of foreign copper, which is not accounted for in the import statistics, is that of the pyrites brought in for the manufacture of sulphuric acid. Some of these pyrites are not high enough in copper for subsequent treatment, but the greater part of those from Canada and from the Iberian Peninsula are smelted for the metal. Returns from the works treating pyrites ciuder justify an estimate of the copper recovered of 7,000,000 pounds.

We have, therefore, imports of copper in the form of copper mattes, nickel-copper matte, and pyrites, aggregating about 19,750,000 pounds, a share of which goes to swell the supply of the domestic market, while a part appears in the export statistics as domestic material.

The imports of ore and matte, by ports of entry, for the two years 1897 and 1898 are shown in the following table:

Imports of copper ore and regulus, 1897 and 1898, by ports.

Port of entry.	1897.		1898.	
	Quantity.	Value.	Quantity.	Value.
	<i>Long tons.</i>		<i>Long tons.</i>	
Newark, N. J	142	\$23, 377		
Corpus Christi, Tex.....	283	6, 867	20	\$2, 141
Paso del Norte, Tex.....	212	37, 453	39	10, 001
Saluria, Tex	972	22, 534		
Arizona	59	7, 468	33	4, 169
Puget Sound, Wash.....	2, 188	517, 067	1, 850	477, 462
Memphremagog, Vt.....	35	3, 125	336	24, 495
Oswegatchie, N. Y	20	4, 467	288	65, 001
Kansas City, Mo.....	909	147, 223		
Omaha, Nebr	169	26, 411		
New York.....			478	69, 964
All others.....	96	3, 999	19	1, 122
Total	5, 085	799, 991	3, 063	654, 355

The imports of pigs, bars, and old copper during 1897 and 1898, by countries, were as follows:

Imports of pigs, bars, and old copper, by countries of origin, in 1897 and 1898.

Country.	1897.		1898.	
	Quantity.	Value.	Quantity.	Value.
	<i>Pounds.</i>		<i>Pounds.</i>	
Germany	68,080	\$13,265	420,959	\$62,498
United Kingdom	597,468	75,937	3,321,695	329,473
Quebec, Ontario, etc.	96,049	7,198	244,956	21,084
British Columbia	1,166,364	143,759	1,776,247	180,913
Mexico	11,995,023	929,641	44,544,825	3,151,680
West Indies:				
British	352,594	29,584	118,150	9,405
San Domingo	82,521	8,086	8,050	613
Cuba	1,029,832	86,948	844,520	64,568
Chile	895,987	97,130	2,028,383	222,375
Japan	514,567	53,194		
All others	124,613	9,274	858,682	78,071
Total	16,923,098	1,454,016	54,166,467	4,120,680

The most striking increase is that of the imports from Mexico. A part of the total is really copper produced in this country—in Arizona—returned for refining, after enriching. We estimate this quantity at about 3,325,000 pounds. A part of it is Boleo copper in transit to Europe, the amount being about 15,500,000 pounds. Recently the product of the El Cobre Grande Copper Company, of Sonora, is imported via Nora, the terminus of the railroad near Bisbee, Ariz. The greater part of the balance is blister copper, produced at works controlled by companies in this country and subjected to further metallurgical treatment here. A certain quantity is old copper.

The following table shows the ports of entry:

Imports of copper—pigs, bars, old, and other manufactured—by ports of entry, in 1898.

Port of entry.	Quantity.	Value.
	<i>Pounds.</i>	
Newark, N. J.	1,693,165	\$175,131
New York, N. Y.	15,703,358	1,546,833
Passamaquoddy, Me.	105,288	5,038
Perth Amboy, N. J.	1,348,900	127,906
Corpus Christi, Tex.	2,270,581	157,406
Nogales, Ariz.	32,589,551	2,066,461
San Francisco, Cal.	119,539	15,401
Other ports	336,085	26,504
Total	54,166,467	4,120,680

EXPORTS.

The exports of copper in the form of ore (including matte), ingots, and manufactured copper, for a series of years, have been as follows:

Copper and copper ore of domestic production exported from the United States, 1864 to 1898.

[Cwts. are long hundredweights of 112 pounds.]

Year ending—	Ore and matte.		Pigs, bars, sheets, and old.	
	Quantity.	Value.	Quantity.	Value.
	<i>Cwts.</i>		<i>Pounds.</i>	
June 30, 1864.....	109,581	\$181,298	102,831	\$43,229
1865.....	225,197	553,124	1,572,382	709,106
1866.....	215,080	792,450	123,444	33,553
1867.....	87,731	317,791	a 4,637,867	303,048
1868.....	92,612	442,921	1,350,896	327,287
1869.....	121,418	237,424	1,134,360	233,932
1870.....	a 19,198	537,505	2,214,658	385,815
1871.....	a 54,445	727,213	581,650	133,020
1872.....	35,564	101,752	267,868	64,844
1873.....	45,252	170,365	38,958	10,423
1874.....	13,326	110,450	503,160	123,457
1875.....	a 51,305	729,578	5,123,470	1,042,536
1876.....	15,304	84,471	14,304,160	3,098,395
1877.....	21,432	109,451	13,461,553	2,718,213
1878.....	32,947	169,020	11,297,876	2,102,455
1879.....	23,070	102,152	17,207,739	2,751,153
1880.....	21,623	55,763	4,206,258	667,242
1881.....	9,958	51,499	4,865,407	786,860
1882.....	25,936	89,515	3,340,531	565,295
1883.....	112,923	943,771	8,221,363	1,293,947
1884.....	386,140	2,930,895	17,044,760	2,527,829
1885.....	432,300	4,739,601	44,731,858	5,339,887
Dec. 31, 1886.....	417,520	2,241,164	19,553,421	1,968,772
1887.....	501,280	2,774,464	12,471,393	1,247,928
1888.....	794,960	6,779,294	31,706,527	4,906,805
1889.....	818,500	8,226,206	16,813,410	1,896,752
1890.....	431,411	4,413,067	10,971,899	1,365,379
1891.....	672,120	6,565,620	69,279,024	8,844,304
1892.....	943,040	6,479,758	30,515,736	3,438,048
1893.....	835,040	4,257,128	138,984,128	14,213,378
1894.....	87,040	440,129	162,393,000	15,324,925
1895.....	276,480	1,631,251	121,328,390	12,222,769
1896.....	414,265	2,393,914	259,223,924	27,822,280
1897.....	181,280	1,199,029	277,255,742	30,597,645
1898.....	186,860	755,443	291,955,905	33,598,869

a Evidently errors in quantities.

COPPER.

195

Copper and copper ore of domestic production exported, etc.—Continued.

Year ending—	Value of manufactured product.	Total value.
June 30, 1864.....	\$208, 043	\$432, 570
1865.....	282, 640	1, 544, 870
1866.....	110, 208	936, 211
1867.....	171, 062	791, 901
1868.....	152, 201	922, 409
1869.....	121, 342	592, 698
1870.....	118, 926	1, 042, 246
1871.....	55, 198	915, 431
1872.....	121, 139	287, 735
1873.....	78, 288	259, 076
1874.....	233, 301	467, 208
1875.....	43, 152	1, 815, 266
1876.....	343, 544	3, 526, 410
1877.....	195, 730	3, 023, 394
1878.....	217, 446	2, 488, 921
1879.....	79, 900	2, 933, 205
1880.....	126, 213	849, 218
1881.....	38, 036	876, 395
1882.....	93, 646	748, 456
1883.....	110, 286	2, 348, 004
1884.....	137, 135	5, 595, 859
1885.....	107, 536	10, 187, 024
Dec. 31, 1886.....	76, 386	4, 386, 322
1887.....	92, 064	4, 114, 456
1888.....	211, 141	11, 897, 240
1889.....	86, 764	10, 209, 722
1890.....	139, 949	5, 918, 395
1891.....	293, 619	15, 703, 543
1892.....	245, 064	10, 162, 870
1893.....	464, 991	18, 935, 497
1894.....	378, 040	16, 143, 094
1895.....	1, 084, 289	14, 938, 309
1896.....	819, 017	31, 035, 211
1897.....	958, 379	32, 755, 053
1898.....	1, 190, 939	35, 545, 251

The destination of our exports of copper bars, ingots, plates, and old copper during the years 1895, 1896, 1897, and 1898 is shown by the following table, the data having been furnished by the Bureau of Statistics:

Exports of copper bars and ingots for 1895, 1896, 1897, and 1898.

Country.	1895.	1896.	1897.	1898.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>
United Kingdom	24, 064, 694	78, 479, 716	63, 774, 004	88, 443, 870
Austria	3, 228, 545	6, 532, 949	5, 918, 993	7, 478, 730
Belgium	8, 384, 995	9, 648, 271	16, 651, 776	13, 613, 183
France	25, 266, 032	45, 502, 864	59, 630, 864	53, 909, 508
Germany	14, 962, 257	29, 609, 837	29, 746, 200	42, 891, 345
Netherlands	40, 451, 380	72, 994, 600	86, 581, 616	72, 418, 633
Italy	901, 485	4, 067, 160	3, 757, 920	3, 733, 672
Russia	2, 968, 001	10, 741, 821	8, 515, 772	7, 340, 276
Mexico	151, 664	170, 340		253, 975
British North America.	398, 906	234, 845		1, 523, 505
West Indies	1, 721	1, 241, 705	2, 678, 597	6, 143
Other countries	548, 710			343, 065
Total	121, 328, 390	259, 224, 108	277, 255, 742	291, 955, 905

German statisticians take credit for practically the entire copper imports of Holland, claiming that the metal is in transit for German consumers, and the careful investigations of the German statistical bureau bear out this claim. Therefore the exports of copper from the United States to Germany figure up 115,309,978 pounds. Of this, only a small quantity is in transit for Austria and Russia, so that Germany is by far the largest customer of this country. It is worthy of note, too, that some American copper is shipped via England and Holland to Germany, so that some of the metal credited to the first is really destined for Germany.

Transit shipments are more and more complicating the situation. Thus it is a matter of grave doubt whether the quantities of copper enumerated as having been forwarded to France is of domestic origin. It is well known that considerable quantities of copper produced at the Boleo mines in Lower California, Mexico, are shipped overland to New Orleans and are exported from that port. Thus in 1898 the exports from New Orleans were 15,508,831 pounds, while the imports from Mexico were 44,544,825 pounds. Approximately the former figure is therefore contained in the latter.

Besides this mere transit trade, it is more than probable that considerable quantities of foreign copper undergo metallurgical treatment in this country and are subsequently exported in part to Europe. This is certainly the case with a good deal of Mexican and British Columbian copper.

The following table shows the export ports:

Exports of ingots, bars, and old copper in 1897 and 1898.

District.	1897.	1898.
	<i>Pounds.</i>	<i>Pounds.</i>
Baltimore, Md	88,389,939	87,027,133
Boston and Charlestown, Mass	928,584	439,368
Newark, N. J		673,180
Newport News, Va	5,899,609	2,638,868
Norfolk, Va		5,249,820
New York, N. Y	167,344,812	178,400,314
Philadelphia, Pa	227,023	68,624
New Orleans, La	13,882,408	15,508,831
Galveston, Tex		444,920
Detroit, Mich	164,317	728,689
Huron, Mich	229,226	118,827
Burlington, Vt	102,718	410,410
All others	87,106	246,921
Total	277,255,742	291,955,905

The exports of ore and matte in 1897 aggregated 9,064 long tons, valued at \$1,199,029, of which 8,000 tons, valued at \$1,062,938, went to Great Britain, and 773 tons, valued at \$84,273, to Mexico. It is understood that the latter movement is due to the shipment of material from the Arizona plant to a Mexican works for a special purpose.

In 1898 the exports of matte were 9,343 long tons, of which 4,419 tons, valued at \$274,370, again went to Mexico to be used as a carrier for the precious metals. The metal in this matte, which when exported contains about 37½ per cent of copper, comes back for parting and refining to New York. During the year 1899 a small quantity of Tennessee matte was in a similar manner exported for enriching to Mexico to be returned to this country. Of the balance of the matte exported, 4,898 long tons, valued at \$478,373 went to England, 24 tons to Canada, and 2 tons to Germany. Estimating its copper contents at 55 per cent, it represents an export of about 5,420,000 pounds fine. It is impossible to judge from the statistics whether a part of it may not have been British Columbian matte in transit to England.

Under the circumstances it seems safest to entirely ignore the matte exports to Mexico, and to place the fine copper contents exported in the form of matte at 5,420,000 pounds.

THE COPPER MARKETS.

The following table summarizes the highest and lowest prices obtained for Lake copper monthly in the New York markets from 1860 to 1898, both inclusive:

Highest and lowest prices of Lake Superior ingot copper, by months, from 1860 to 1898.

[Cents per pound.]

Year.	January.		February.		March.		April.		May.		June.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
1860.....	24	23½	24	23½	23½	23	23½	23	23½	22½	22½	21½
1861.....	20	19	19½	19	19½	19½	19½	19	19½	19½	19	18
1862.....	28	27	28	25	25	23	23	21½	21½	20½	23	20½
1863.....	35	31	37	35	37	31	31	30	30½	30	30½	30
1864.....	41½	39	42	41½	42½	41½	44	42½	44	43	49	44
1865.....	50½	46	46	44	44½	34	35	34	34	30	30½	28½
1866.....	42	38	38	35½	35½	29½	30	28½	31	29	33	31
1867.....	29½	27	27½	27½	27½	24	24½	23½	24½	24	24½	24
1868.....	23½	21½	24	22½	24	23½	24½	23½	24½	24	24	23½
1869.....	26½	23½	27	26	26½	24	24	23½	24½	23½	23½	22
1870.....	22	21½	21½	20½	20½	19	19½	19½	19½	19	20½	19
1871.....	22½	22	22½	21½	22	21½	21½	21½	21½	21½	21½	21½
1872.....	28½	27½	28½	28½	30½	28½	44	30½	42	36	34½	33
1873.....	35	32½	35	34	35	34½	34½	33½	33½	32	31½	29½
1874.....	25	24½	25	24½	24½	24	25	24½	25	24½	24½	24½
1875.....	23½	21½	22½	21½	21½	21½	21½	21½	23½	22½	23	23
1876.....	23½	23	22½	22½	22½	22	22½	22	22½	21	21	19½
1877.....	19½	19	20½	19½	19½	19	19½	19½	19½	19	19½	19
1878.....	17½	17½	17½	17½	17½	16½	17	16½	16½	16½	16½	16½
1879.....	16	15½	15½	15½	15½	15½	16	15½	16½	16	16½	16½
1880.....	25	21½	24½	24	24	22½	22½	24	21	18	18½	17½
1881.....	19½	19½	19½	19½	19½	19	19	18½	18½	18½	18½	16½
1882.....	20½	20½	20	19	19½	18½	18½	17½	18½	18	18½	18
1883.....	18½	18	17½	17½	17½	17½	16	15½	16	15½	15½	15
1884.....	15	14½	15	14½	15	14½	15	14½	14½	14½	14½	14
1885.....	11½	10½	11½	10½	11½	10½	11½	10½	11½	9½	11½	11
1886.....	11½	11½	11½	11½	11½	11½	11½	11½	11½	10	10½	10
1887.....	12	11½	11½	10½	10½	10½	10½	10	10	9½	10½	10
1888.....	17½	15½	16½	16	16½	15½	16½	16	16½	16½	16½	16½
1889.....	17½	16½	16½	16½	15½	15	16	15½	12½	12	12½	12
1890.....	14½	14½	14½	14½	14½	14	14½	14½	15½	14½	16½	15½
1891.....	15	14½	14½	14½	14½	13½	13½	13½	13½	12½	13	12½
1892.....	11	10½	10½	10½	12	10½	12	11½	12½	12	11½	11½
1893.....	12½	12½	12½	12	12	11½	11½	11½	11½	11	11	10½
1894.....	10½	10	10	9½	9½	9½	9½	9½	9½	9½	9½	9
1895.....	10	9½	9½	9½	9½	9½	9½	9½	10½	9½	10½	10½
1896.....	10½	9½	11½	10	11½	10½	11	10½	11½	10½	11½	11½
1897.....	12	11½	12	11½	11½	11½	11½	11	11½	10½	11½	10½
1898.....	11	10½	11½	11	12	11½	12½	11½	12½	12	11½	11½

199

[Cents per pound.]

Year.	July.		August.		September.		October.		November.		December.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
1860.....	21½	21½	21½	21½	22	21½	22	21½	21½	20½	20½	19½
1861.....	18	17½	19	17½	20½	19	20½	20	22½	20½	27	22½
1862.....	24½	22½	24½	24	27	24½	32½	27	32½	30½	31½	30½
1863.....	32	29	31	29	32½	31	34½	32½	38½	34½	38½	38½
1864.....	55	49	52½	50	52½	47½	48	47	49	47	50	48½
1865.....	30½	28	32	30½	32½	31½	33	32½	45½	33	45½	39½
1866.....	33½	31	31	30	31½	30½	31	30½	30½	26½	29	26½
1867.....	26	24	26½	25½	27½	26½	26½	22½	23	22½	23	21½
1868.....	24½	23½	24½	24	24	23½	24	23	24	22½	24½	23½
1869.....	22½	21½	23½	21½	23	22	22½	22	22½	22	22	21½
1870.....	20½	20½	21½	20½	21½	20½	21½	21½	23½	21½	22½	22½
1871.....	22½	21½	23	22½	23½	22½	23½	23½	24½	23½	27	24½
1872.....	34	33	35	32½	35½	33	34½	31½	32½	30½	32½	30½
1873.....	29	26½	27½	27	27	25½	25½	24	24	21	25	23
1874.....	24½	20	21	19	21½	21	22½	21½	23½	22½	23½	23½
1875.....	23	22½	23½	23	23½	23½	23½	23	23½	23	23½	23½
1876.....	20	19½	19½	18½	21	18½	21½	20½	20½	20	20	19½
1877.....	19½	19	19	17½	18½	17½	18	17½	17½	17½	17½	17½
1878.....	16½	16	16	16	16½	16	16	15½	15½	15½	16	15½
1879.....	16½	16	16½	16	17	16½	21½	18	21½	21	21½	21
1880.....	18½	18½	19½	19	18½	18½	18½	18½	18½	18½	19½	18½
1881.....	16½	16	16½	16½	18½	16½	18½	18	19	18½	20½	19½
1882.....	18½	18½	18½	18½	18½	18	18½	18	18½	18	18	17½
1883.....	15½	15	15	15	15½	15½	15½	15½	15	14½	15	14½
1884.....	14½	13½	14	13½	13½	13	13½	12½	13	12½	12½	11
1885.....	11½	10½	11½	11	11½	10½	11½	10½	11½	10½	11½	11½
1886.....	10½	10	10½	10	11½	10½	11½	11½	12	11½	12½	11½
1887.....	10½	10½	10½	10½	11	10½	12½	10½	14½	11½	17½	14½
1888.....	16½	16½	17	16½	17½	16½	17½	17½	17½	17½	17½	17½
1889.....	12	12	12	12	12	11	11	11	13½	11½	14½	14
1890.....	17½	16½	17½	17	17	17	16½	16½	16½	16½	16	15
1891.....	12½	12½	12½	12	12½	12½	12½	11½	11½	11	11½	10½
1892.....	11½	11½	11½	11½	11½	11½	11½	11½	12	11½	12½	12½
1893.....	10½	10½	10½	9½	9½	9½	9½	9½	10½	9½	10½	10½
1894.....	9½	9	9½	9	9½	9½	9½	9½	9½	9½	10	9½
1895.....	11½	10½	12½	11½	12½	12	12	11½	11½	11	11	10
1896.....	11½	11	11½	10½	10½	10½	10½	10½	11½	10½	11½	11½
1897.....	11½	11	11½	11	11½	11½	11½	11	11	10½	11	10½
1898.....	11½	11½	12½	11½	12½	12½	12½	12½	12½	12½	12½	12½

The following table shows the fluctuations in prices in the English market:

Average values of copper in England.

Year.	Chile bars or G. O. B.	Ore, 25 per cent.	Precipitate.
	<i>Long tons.</i>	<i>Per unit.</i>	<i>Per unit.</i>
	£ s. d.	s. d.	s. d.
1880.....	62 10 0	12 9	12 11
1881.....	61 10 0	12 6	13 8 $\frac{3}{8}$
1882.....	66 17 0	13 6 $\frac{1}{2}$	13 10 $\frac{1}{8}$
1883.....	63 5 10	12 4 $\frac{1}{2}$	12 10 $\frac{1}{8}$
1884.....	54 9 1	10 5 $\frac{1}{2}$	11 1
1885.....	44 0 10	8 4	9 0 $\frac{1}{2}$
1886.....	40 9 3	7 9	8 3 $\frac{1}{2}$
1887.....	43 16 11	8 6	8 11 $\frac{1}{2}$
1888.....	79 19 4 $\frac{1}{2}$	14 3 $\frac{1}{2}$	16 3
1889.....	49 10 5	9 6 $\frac{1}{2}$	.....
1890.....	54 5 5	10 7	.....
1891.....	51 9 8 $\frac{1}{2}$	9 7	.....
1892.....	45 12 8 $\frac{1}{2}$	8 7	.....
1893.....	43 15 6 $\frac{1}{2}$	8 5	.....
1894.....	40 7 4	7 6 $\frac{1}{2}$	.....
1895.....	42 19 7	8 4 $\frac{1}{2}$	.....
1896.....	46 18 1 $\frac{1}{2}$	9 1	.....
1897.....	49 2 6 $\frac{1}{2}$	9 5	.....
1898.....	51 16 7 $\frac{1}{2}$	10 1 $\frac{1}{2}$	.....

In detail, the fluctuations, monthly, of good merchant copper in the English market were as follows in 1895, 1896, 1897, and 1898:

Fluctuations in good merchant copper in England in 1895, 1896, 1897, and 1898.

[Per long ton.]

Month.	1895.	1896.	1897.	1898.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
January	40 13 9 $\frac{1}{2}$	41 13 8 $\frac{1}{2}$	50 10 8 $\frac{1}{2}$	48 19 2
February	39 14 3 $\frac{1}{2}$	44 16 11 $\frac{1}{2}$	51 6 6	49 12 8 $\frac{1}{2}$
March	39 1 9 $\frac{1}{2}$	45 8 0 $\frac{1}{2}$	50 4 0 $\frac{1}{2}$	50 13 2 $\frac{1}{2}$
April	40 3 6 $\frac{1}{2}$	45 3 2 $\frac{1}{2}$	48 16 9	51 14 2 $\frac{1}{2}$
May	43 0 0	46 6 6	48 10 11 $\frac{1}{2}$	51 9 9 $\frac{1}{2}$
June	42 15 6 $\frac{1}{2}$	48 18 0	49 1 1 $\frac{1}{2}$	50 8 0
July	44 0 2 $\frac{1}{2}$	49 3 7 $\frac{1}{2}$	48 1 0 $\frac{1}{2}$	50 3 1
August	46 13 2 $\frac{1}{2}$	47 16 9 $\frac{1}{2}$	48 12 10 $\frac{1}{2}$	51 10 7 $\frac{1}{2}$
September	46 15 7 $\frac{1}{2}$	47 18 7 $\frac{1}{2}$	49 8 5	52 2 8 $\frac{1}{2}$
October	46 4 10	47 11 7	48 10 3	53 8 2
November	43 16 3 $\frac{1}{2}$	49 3 11	48 0 11 $\frac{1}{2}$	55 18 8 $\frac{1}{2}$
December	42 15 11	48 16 9 $\frac{1}{2}$	48 7 0 $\frac{1}{2}$	55 18 11 $\frac{1}{2}$

At the close of the year 1897 the Lake companies had supplied consumers with copper for the first three months at 11 cents, during which period values hardened until 12 cents was reached in March, the end of the engineering strike in England in January having revived consumption there. The breaking out of the Spanish war brought urgent demands upon manufacturers, compensating for a halt in the general demand. In May consumers contracted for a large block of Lake copper at 12 cents, but the pressure to sell led to some weakening, until in June 15,000,000 pounds of Lake copper was sold for future delivery at 11½ cents. In July large amounts of American copper were sold in Europe, and, with the end of the war near, prices showed an advancing tendency in August.

In September the market remained firm and copper was scarce, for immediate delivery, both in this country and in Europe, a condition of affairs which continued in October. An upward start took place early in November, but there was a temporary reaction in England, from which, however, there was a quick recovery. In December the English market hesitated again, but heavy purchases were made and the year closed with the metal in an exceedingly strong position.

THE WORLD'S PRODUCTION.

Messrs. Henry R. Merton & Co., of London, have compiled the following statement of the world's production, the figures being modified by this office where official statistics are available:

The copper production of the world, 1889 to 1898, inclusive.

[Long tons.]

Country.	1889.	1890.	1891.	1892.
EUROPE.				
Great Britain	905	935	720	495
Spain and Portugal:				
Rio Tinto	29,500	30,000	31,827	31,539
Tharsis	a 11,000	a 10,300	a 11,100	11,258
Mason and Barry	a 5,250	a 5,600	a 4,150	a 4,400
Sevilla	1,350	810	875	1,070
Other mines	a 7,170	a 4,790	a 6,390	a 7,992
Germany:				
Mansfeld	15,506	15,800	14,250	15,360
Other German	a 1,850	1,825	1,900	1,935
Austria	1,225	1,210	1,016	823
Hungary	a 300	a 300	285	285
Sweden	830	830	655	735
Norway	1,357	1,390	1,247	1,410
Italy	1,300	1,362	1,536	2,523
Russia	4,070	4,800	4,800	4,823
Total	81,613	79,952	80,751	84,648
NORTH AMERICA.				
United States	101,239	115,966	126,839	154,072
Canada	3,040	2,685	3,986	3,164
Newfoundland	2,615	1,735	2,040	2,390
Mexico:				
Boleo	3,280	3,450	4,175	6,415
Other Mexican	500	875	1,025	900
Total	110,674	124,711	138,065	166,941
SOUTH AMERICA.				
Chile	24,250	26,120	19,875	22,565
Bolivia:				
Corocoro	a 1,200	1,900	2,150	2,860
Peru	275	150	280	290
Venezuela:				
New Quebrada	6,068	5,640	6,500	3,100
Argentina	190	150	210	200
Total	31,983	33,960	29,015	29,015

a Estimated.

COPPER.

203

The copper production of the world, 1889 to 1898, inclusive—Continued.

[Long tons.]

Country.	1889.	1890.	1891.	1892.
AFRICA.				
Algiers.....	160	120	120	.....
Cape of Good Hope:				
Cape Company.....	a 7,700	5,000	5,100	5,670
Namaqua.....		1,450	900	450
Total.....	7,860	6,570	6,120	6,120
ASIA.				
Japan.....	16,125	17,972	18,500	19,000
Total.....	16,125	17,972	18,500	19,000
AUSTRALIA.				
New South Wales.....	4,082	3,455	4,192	4,185
South Australia.....	7,500	6,000	6,100	4,600
Total.....	11,582	9,455	10,292	8,785

Country.	1893.	1894.	1895.	1896.	1897.	1898.
EUROPE.						
Great Britain.....	425	445	580	555	555	a 550
Spain and Portugal:						
Rio Tinto.....	31,954	31,061	32,985	34,501	33,923	33,705
Tharsis.....	11,000	11,000	12,000	12,000	12,000	a 12,000
Mason and Barry ...	a 4,400	a 4,200	a 4,100	a 3,900	a 4,300	3,600
Sevilla.....	1,270	1,170	1,050	1,025	810	800
Other mines.....	6,225	4,805	4,300	3,400	3,050	3,120
Germany:						
Mansfeld.....	14,150	14,990	14,860	18,265	17,960	18,045
Other German.....	2,000	2,210	1,695	1,800	2,185	2,040
Austria.....	1,211	1,781	869	1,065	1,210	1,110
Hungary.....	210	310	239	205	445	430
Sweden.....	535	350	203	500	545	480
Norway.....	1,860	1,885	2,685	a 2,500	3,450	3,615
Italy.....	2,333	2,629	2,236	3,400	3,480	3,435
Russia.....	5,349	5,638	5,326	5,100	6,025	a 6,000
Total.....	82,922	82,474	83,128	88,216	89,938	88,930

a Estimated.

The copper production of the world, 1889 to 1898, inclusive—Continued.

[Long tons.]

Country.	1893.	1894.	1895.	1896.	1897.	1898.
NORTH AMERICA.						
United States	147,033	158,120	169,917	205,384	220,571	235,050
Canada	a 1,000	1,204	3,923	4,190	5,938	8,040
Newfoundland	2,040	1,900	1,800	1,800	1,800	2,100
Mexico:						
Boleo	7,980	10,370	10,450	9,940	10,170	9,435
Other Mexican	500	1,400	1,170	1,210	a 4,200	a 9,000
Total	158,553	172,994	187,260	222,524	242,679	263,625
SOUTH AMERICA.						
Chile.....	21,350	21,340	22,075	23,500	21,900	24,850
Bolivia:						
Corocoro	2,500	2,300	2,250	2,000	2,200	2,050
Peru	460	440	450	740	1,000	3,040
Venezuela:						
New Quebrada	2,850	2,500	.....	.....	.....	.....
Argentina	160	230	150	100	200	125
Total	27,320	26,810	24,925	26,340	25,300	30,065
AFRICA.						
Algiers.....	.....	.....	35	.....	.....	50
Cape of Good Hope:						
Cape Company	5,200	5,000	5,350	5,470	5,290	4,660
Namaqua.....	890	1,500	1,730	1,980	2,150	2,400
Total	6,090	6,500	7,115	7,450	7,440	7,110
ASIA.						
Japan.....	18,000	20,050	18,430	21,000	23,000	25,175
Total	18,000	20,050	18,430	21,000	23,000	25,175
AUSTRALIA.						
New South Wales	1,558	1,847	3,322	4,467	6,922	a 7,000
South Australia	4,600	4,944	5,251	4,877	4,900	a 5,000
Tasmania .....	.....	.....	.....	1,928	4,956	a 6,000
Total	6,158	6,791	8,573	11,272	16,778	18,000

a Estimated.

COPPER.

205

The copper production of the world, 1889 to 1898, inclusive—Continued.

RECAPITULATION.

[Long tons.]

Country.	1889.	1890.	1891.	1892.	1893.
Europe.....	81,613	79,952	80,751	84,648	82,922
North America	110,674	124,711	138,065	166,941	158,553
South America	31,983	33,960	29,015	29,015	27,320
Africa.....	7,860	6,570	6,120	6,120	6,090
Asia	16,125	17,972	18,500	19,000	18,000
Australia.....	11,582	9,455	10,292	8,785	6,158
Total	259,837	272,620	282,713	314,509	299,043

Country.	1894.	1895.	1896.	1897.	1898.
Europe.....	82,474	83,128	88,216	89,938	88,930
North America	172,994	187,260	222,524	242,679	263,625
South America	26,810	24,925	26,340	25,300	30,065
Africa.....	6,500	7,115	7,450	7,440	7,110
Asia	20,050	18,430	21,000	23,000	25,175
Australia.....	6,791	8,573	11,272	16,778	18,000
Total	315,619	329,431	376,802	405,135	432,905

Since 1889 the world's production has increased by 173,068 long tons, of which there are to the credit of the United States 133,821 long tons.

THE ENGLISH COPPER TRADE.

Since England is one of the leading copper markets of the world, the following tables, showing the import and export movement, are of great interest:

British imports and exports of copper.

[Long tons.]

Year.	Imports of—		Total imports.	Exports.	Apparent English consumption.
	Bars, cakes, and ingots.	Copper in ores and furnace products.			
1860.....	13, 142	13, 715	26, 857	26, 117	.....
1865.....	23, 137	23, 922	47, 059	41, 398	.....
1870.....	30, 724	27, 025	57, 749	53, 006	.....
1871.....	33, 228	23, 671	56, 899	56, 633	.....
1872.....	49, 000	21, 702	70, 702	53, 195	.....
1873.....	35, 840	26, 756	62, 596	55, 716	.....
1874.....	39, 906	27, 894	67, 800	59, 742	.....
1875.....	41, 931	29, 483	71, 414	51, 870	.....
1876.....	39, 145	36, 191	75, 336	52, 468	.....
1877.....	39, 743	53, 582	93, 325	54, 088	.....
1878.....	39, 360	48, 212	87, 572	55, 001	.....
1879.....	46, 670	50, 421	97, 091	62, 412	30, 774
1880.....	36, 509	56, 225	92, 734	59, 482	32, 879
1881.....	32, 170	54, 057	86, 227	61, 689	31, 607
1882.....	35, 509	58, 366	93, 875	55, 683	42, 877
1883.....	35, 653	63, 493	99, 146	59, 350	40, 469
1884.....	39, 767	69, 623	109, 390	64, 691	51, 263
1885.....	41, 933	81, 616	123, 549	62, 080	54, 323
1886.....	42, 969	65, 046	108, 015	60, 511	41, 158
1887.....	29, 198	73, 891	103, 089	69, 453	53, 096
1888.....	44, 063	90, 867	135, 470	^a 72, 066	42, 562
1889.....	^b 38, 576	101, 407	139, 983	75, 627	65, 759
1890.....	^c 49, 461	91, 788	141, 249	89, 747	66, 170
1891.....	44, 213	94, 403	138, 616	76, 056	59, 223
1892.....	^d 35, 015	99, 356	134, 371	82, 542	^e 48, 367
1893.....	41, 829	88, 003	129, 832	70, 986	66, 817
1894.....	56, 157	68, 851	125, 008	54, 689	61, 330
1895.....	42, 135	77, 806	119, 941	65, 990	62, 692
1896.....	60, 458	75, 398	135, 856	59, 334	89, 191
1897.....	60, 428	76, 127	136, 555	56, 542	84, 631
1898.....	67, 978	71, 726	139, 704	63, 256	.....

^a Including 22,557 tons of Chile bars transferred to France.

^b Including 1,166 tons of Chile bars transferred from France to England.

^c Including 3,501 tons of Chile bars transferred from France to England.

^d Including 3,585 tons of Chile bars transferred from France to England.

^e Add 4,001 tons for comparison with former years, the difference arising from the new method of making up stock.

The following figures from the board of trade returns, supplemented by Messrs. James Lewis & Son, of Liverpool, for the past ten years show in detail the form in which the copper is brought into Great Britain and in what form it is exported:

Imports of copper into Great Britain from 1889 to 1898, inclusive.

[Long tons.]

Character.	1889.	1890.	1891.	1892.	1893.
Pure in pyrites.....	16,097	16,422	15,406	15,110	15,320
Pure in precipitate...	25,110	25,563	29,326	28,444	24,988
Pure in ore.....	22,219	18,000	14,172	13,585	11,701
Pure in matte.....	37,981	31,803	35,499	42,217	35,994
Bars, cakes, etc.....	38,576	49,461	41,213	35,015	41,829
Total.....	139,983	141,249	138,616	134,371	129,832

Character.	1894.	1895.	1896.	1897.	1898.
Pure in pyrites.....	15,401	14,561	14,726	15,576	16,626
Pure in precipitate...	24,878	26,508	23,160	25,932	21,558
Pure in ore.....	12,804	15,240	12,499	11,980	14,576
Pure in matte.....	15,767	21,497	25,013	22,639	18,966
Bars, cakes, etc.....	56,158	42,135	60,458	60,428	67,978
Total.....	125,008	119,941	135,856	136,555	139,704

The following table gives the details relating to the British imports of precipitate and matte:

Imports of precipitate and matte into Great Britain from 1888 to 1898, inclusive.

[Long tons.]

Country.	Fine copper.				
	1888.	1889.	1890.	1891.	1892.
Portugal and Spain...	30,119	28,157	28,018	32,425	32,509
Chile.....	734	1,919	2,122	595	2,040
United States.....	20,752	26,581	18,897	19,109	24,668
Other countries.....	4,362	6,434	8,329	12,696	11,444
Total.....	55,967	63,091	57,366	64,825	70,661

Country.	Fine copper.					
	1893.	1894.	1895.	1896.	1897.	1898.
Portugal and Spain...	29,359	28,645	30,196	28,596	32,821	28,137
Chile.....	2,714	626	212	797	2,233	1,758
United States.....	20,700	2,133	8,337	10,016	5,259	2,181
Other countries.....	8,209	9,242	9,660	8,764	8,258	8,458
Total.....	60,982	40,646	48,405	48,173	48,571	40,534

Messrs. James Lewis & Son, of Liverpool, estimate as follows the imports of copper product in Liverpool, Swansea, and London during the years from 1887 to 1898, which represent the total imports, with the exception of precipitate, into Newcastle and Cardiff, reliable returns of which can not be obtained, but which was estimated to vary from 8,000 to 10,000 tons fine per annum in former years, and in the last few years has been placed as high as 12,000 tons, but in 1898 was reduced to 6,000 tons:

Imports of copper product into Liverpool, Swansea, and London.

[Long tons.]

Country.	1887.	1888.	1889.	1890.	1891.	1892.
Chile	20,008	24,479	22,070	22,909	14,378	17,619
United States	16,534	25,730	30,729	20,171	26,120	26,475
Spain and Portugal...	5,178	5,915	5,189	5,202	4,734	5,372
Spain and Portugal (precipitate)	13,042	15,568	17,192	18,430	17,439	14,831
Spain and Portugal (pyrites)	14,940	15,448	16,097	16,422	15,406	15,110
Australia	6,047	6,746	6,285	6,561	6,265	5,547
Cape of Good Hope...	8,271	8,829	11,507	9,927	7,452	8,092
Venezuela	2,261	3,574	4,299	5,245	5,017	5,028
Japan	200	4,469	2,523	10,674	7,852	4,989
Italy	1,055	1,058	1,043	953	649	725
Norway	-----	545	234	80	30	38
Canada	94	156	181	264	189	120
Newfoundland	359	465	631	1,552	1,617	3,229
Mexico	61	158	3,938	3,325	3,616	869
Peru	13	202	271	254	279	287
River Plate	167	135	184	143	211	196
Other countries	1,074	4,054	1,389	225	236	1,245
Total tons fine..	89,304	117,531	123,762	122,837	111,490	109,772

Imports of copper product into Liverpool, Swansea, and London—Continued.

[Long tons.]

Country.	1893.	1894.	1895.	1896.	1897.	1898.
Chile	15,875	16,971	18,197	15,923	14,982	17,734
United States	35,647	30,495	17,098	39,676	32,792	38,979
Spain and Portugal ..	5,674	4,674	3,288	6,298	7,697	7,293
Spain and Portugal (precipitate)	10,296	10,642	12,612	11,474	17,386	15,664
Spain and Portugal (pyrites)	15,320	15,401	14,561	14,726	15,576	16,626
Australia	6,293	6,481	8,223	10,635	10,218	13,409
Cape of Good Hope...	5,472	6,112	6,524	5,905	7,575	9,381
Venezuela	1,434	2,327	360	107	21	.....
Japan	2,370	3,299	4,258	3,492	3,654	2,066
Italy	1,091	763	283	418	100	177
Norway .....	.....	30	486	528	130	.....
Canada	50	105	.....	.....	127	.....
Newfoundland	2,265	1,279	3,244	2,467	2,484	1,359
Mexico	1,185	1,408	4,623	7,792	6,217	4,888
Peru	462	443	449	741	998	3,041
River Plate	160	229	148	94	190	124
Other countries	1,944	855	930	797	1,613	1,807
Total tons fine..	105,638	101,514	95,284	121,073	121,760	132,568

The quantities of copper in different forms which were imported from the United States to Great Britain and France are given in the following table:

Imports of copper from the United States into England and France.

[Long tons.]

Country.	1887.	1888.	1889.	1890.	1891.	1892.
England:						
Ore	26	298	349	5	4	18
Matte	15,039	20,752	26,581	18,897	19,109	24,668
Bars and ingots ..	1,469	4,680	3,799	1,269	7,007	1,427
Total	16,534	25,730	30,729	20,171	26,120	26,113
France	3,910	6,496	1,058	1,733	8,329	4,340
United States into England and France	20,444	32,226	31,787	21,904	34,449	30,453
Chile into England and France	29,019	32,947	22,020	24,641	18,820	19,840
Country.	1893.	1894.	1895.	1896.	1897.	1898.
England:						
Ore	23	5				
Matte	20,700	2,133	8,337	10,016	5,259	2,181
Bars and ingots ..	14,924	28,357	12,250	29,780	27,591	36,790
Total	35,647	30,495	20,587	39,796	32,850	38,971
France	12,483	9,248	11,806	21,998	26,165	22,753
United States into England and France	48,130	39,743	32,393	61,794	59,015	61,724
Chile into England and France	19,717	20,783	22,161	22,593	20,842	24,303

THE FRENCH COPPER TRADE.

The direct imports of copper from different countries into France were as follows for a series of years, according to Messrs. James Lewis & Son :

Direct imports into France from 1887 to 1898, inclusive.

[Long tons.]

Year.	Chile.	United States.	Mexico.	Other countries.	Total.
1887.....	9,011	3,910	.....	1,048	13,969
1888.....	8,468	6,496	2,700	6,905	24,569
1889.....	2,470	1,058	738	1,715	5,981
1890.....	2,803	1,733	.....	975	5,511
1891.....	4,442	8,329	.....	2,118	14,889
1892.....	2,221	4,340	2,515	2,208	11,284
1893.....	3,842	12,483	7,620	2,908	26,853
1894.....	3,812	9,248	6,299	1,588	20,947
1895.....	3,964	11,806	4,520	2,505	22,795
1896.....	7,030	21,998	3,627	3,700	36,355
1897.....	4,806	26,165	5,677	2,557	39,205
1898.....	6,612	22,753	5,722	2,350	37,437

According to the French official statistics, the imports of bars, ingots, etc., were as follows :

Imports of copper into France.

[Metric tons.]

Source.	1895.	1896.	1897.	1898.
England	8,250	5,596	3,884	5,970
Chile.....	3,494	4,573	2,804	4,469
United States	11,157	21,279	28,118	26,210
Other countries	11,717	12,197	14,830	10,712
Total	34,618	43,645	49,636	47,361

The exports of copper from Great Britain, estimating the fine contents of alloys, were as follows:

Exports of copper from Great Britain from 1888 to 1898, inclusive.

[Long tons.]

Character.	1888.	1889.	1890.	1891.	1892.	1893.
English, wrought and unwrought, and sheets	32,058	48,189	58,571	51,765	58,518	45,349
Yellow metal, at 60 per cent	4,513	9,195	10,514	8,547	8,853	8,745
Brass, at 70 per cent....	2,650	3,773	3,721	3,992	3,783	4,049
Total	39,221	61,157	72,806	64,304	71,154	58,143
Fine foreign.....	^a 32,845	14,470	16,941	11,752	11,388	12,843
Total	72,066	75,627	89,747	76,056	82,542	70,986

Character.	1894.	1895.	1896.	1897.	1898.
English, wrought and unwrought, and sheets	34,874	45,299	38,734	35,951	40,223
Yellow metal, at 60 per cent.....	9,514	8,978	6,773	6,609	6,172
Brass, at 70 per cent....	3,808	3,747	4,172	3,936	3,733
Sulphate of copper	^b 10,000	^b 12,000	13,155	14,844	13,078
Total	58,196	70,024	62,834	61,340	63,206
Fine foreign.....	6,493	7,966	9,655	10,046	13,242
Total	64,689	77,990	72,489	71,386	76,448

^a Including 22,557 tons Chile bars transferred to France.

^b Estimated.

Since 1894 the copper contents of sulphate exported has been introduced into the table.

A comparison shows that there are striking discrepancies between the statistics collected by Messrs. James Lewis & Son and the official returns, which it seems difficult to harmonize. Messrs. Aron Hirsch & Sohn, of Halberstadt, Germany, in the annual statistical report, present the following as drawn from official sources:

French imports and exports of copper.

[Metric tons.]

	1893.	1894.	1895.	1896.	1897.	1898.
Imports of bars, ingots, etc.....	30,398	28,654	34,618	43,646	49,636	47,361
Deduct exports.....	7,019	5,322	4,910	5,144	4,768	5,458
	23,379	23,332	29,708	38,502	44,868	41,903
Add old copper, excess of imports over ex- ports.....	2,892	2,411	4,644	5,524	5,192	6,157
Supply	26,271	25,743	34,352	44,026	50,060	48,060

Imports and exports of ores, matte, etc.

[Metric tons.]

	1893.	1894.	1895.	1896.	1897.	1898.
Imports	20,543	11,643	10,448	9,216	12,408	8,780
Exports	10,214	5,021	1,771	1,260	2,161	1,784
Supply	10,329	6,622	8,677	7,956	10,247	6,996

Messrs. Hirsch & Sohn, holding that the bulk of this material is rich, like Boleo mattes and Corocoro ores, estimate its contents at 70 per cent, and on this basis estimate the copper consumption of France as follows:

Copper consumption of France.

[Metric tons.]

	1893.	1894.	1895.	1896.	1897.	1898.
Imports, raw material ..	26,271	25,743	34,352	44,026	50,060	48,060
Contents of ore.....	7,230	4,635	6,074	5,570	8,685	7,024
Total	33,501	30,378	40,426	49,596	58,745	55,084
Increase (+) or decrease (—) of stocks.....	+355	+1,459	—103	—589	—379	—515
Consumption.....	33,856	31,837	40,323	49,007	58,366	54,569

These figures are valuable as showing the very rapid increase in the consumption, slightly checked in 1898.

THE GERMAN COPPER TRADE.

German copper consumption has grown very rapidly. The following table, compiled by Messrs. Aron Hirsch & Sohn, of Halberstadt, shows the principal figures. There is included in the production the copper extracted in German metallurgical works from imported ores and mattes. An allowance is made for this in the table.

Copper consumption of Germany.

[Metric tons.]

	1892.	1893.	1894.	1895.	1896.	1897.	1898.
Imports	44,514	51,806	52,504	59,742	73,123	82,903	89,772
Exports	9,817	11,304	10,406	10,893	12,452	12,568	14,957
Excess of imports.	34,697	40,502	42,098	48,849	60,671	70,335	74,815
Production.....	25,406	24,011	25,857	26,013	29,489	29,468	30,703
Total	60,103	64,513	67,955	74,862	90,160	99,803	105,518
Copper contents of imported copper ore and iron py- rites	4,000	4,000	5,000	4,500	5,000	3,500	4,000
Home consump- tion.....	56,103	60,513	62,955	70,362	85,160	96,303	101,518

a Estimated.

The imports for 1898 include 73,290 tons of bars and ingots, 4,720 tons of coin and scrap, 1,155 tons copper contents old brass, 1,528 tons of copper from imported ores, and 9,079 tons from imported pyrites.

The source of the imports of bars and ingots for a series of years is shown in the following table, which proves how important a contributor to the German markets this country has become:

Source of German imports of ingot copper.

[Metric tons.]

Country.	1894.	1895.	1896.	1897.	1898.
Free port (Hamburg)...	1,689	1,185	2,371	2,669	2,873
Belgium	356	356	115	9	216
France	303	152	81	268	121
Norway	128	362	71	45	32
Austria-Hungary	50	197	11	9	12
Sweden	33	83	198	250	328
Switzerland			5	6	2
Spain	10		10	41	69
England	7,430	7,363	7,478	8,660	12,754
Netherlands	109	139	73	18	19
United States	23,795	31,311	42,504	50,420	52,473
Japan	2,072	1,932	1,916	2,655	2,196
Chile	884	825	827	2,217	1,216
Australia		313	183	259	742
Other countries	173	147	271	46	25
Total	37,032	44,365	56,114	67,572	73,078

The production of Germany for a series of years has been as follows. The output of the Mansfeld Company is added, since that corporation is the dominating factor:

Copper production of Germany.

[Metric tons.]

Year.	Total production.	Production of Mansfeld.
1891	24,688	15,365
1892	25,406	15,588
1893	24,011	14,358
1894	25,857	15,217
1895	26,013	15,083
1896	29,489	18,541
1897	29,468	18,248
1898	30,703	18,335

It will be observed that Mansfeld considerably increased its production in 1896, and has since held its own.

A very notable fact in connection with the German copper trade is the rapid expansion in exports of copper manufactures, which reached a climax in 1898. Since 1892 the exports have more than doubled, as is shown by the following table:

Exports of copper manufactures from 1892 to 1898, inclusive.

[Metric tons.]

	1892.	1893.	1894.	1895.	1896.	1897.	1898.
Rods and sheets...	4,507	4,889	5,009	4,700	5,429	5,712	5,369
Wire.....	2,565	3,052	4,433	3,975	5,909	6,175	5,930
Cables	1,526	1,957	2,193	3,713	7,631	8,119	10,432
Miscellaneous	492	563	501	556	279	245	263
Coarse forgings....	1,902	2,050	2,538	2,643	2,648	2,703	2,988
Cartridges,caps,etc	2,374	3,682	3,376	4,450	4,156	2,712	3,288
Fine copper goods..	3,234	3,859	4,117	4,912	7,837	7,425	8,454
Total.....	16,600	20,052	22,167	24,949	33,889	33,091	36,724

THE RUSSIAN COPPER TRADE.

The following table shows the consumption of copper in Russia, to which American producers contribute to some extent:

Copper consumption of Russia.

[Metric tons.]

	1892.	1893.	1894.	1895.	1896.	1897.
Imports of fine copper.....	7,803	12,340	10,442	11,033	14,090	15,280
Imports of manufactures ..	1,032	1,442	1,049	655	723	673
Production.....	4,901	5,436	5,730	5,413	5,721	6,596
Consumption.....	13,736	19,218	17,221	17,101	20,534	22,549

The production of the Russian mines during 1894, 1895, 1896, and 1897 was as follows, by districts, in poods:

Copper production in Russia.

[Poods.]				
	1894.	1895.	1896.	1897.
Caucasus.....	150,000	145,805	149,698	162,534
Ural.....	155,000	149,032	166,205	192,839
Altai.....	17,000	12,566	13,240	15,427
Steppes district.....			1,868	3,586
Finland: Pitkaranda.....	27,500	20,274	18,000	18,000
Total.....	349,500	327,677	349,011	392,386
In metric tons (61 poods).....	5,730	5,372	5,721	6,433

Summarizing the estimates of Messrs. Aaron Hirsch & Sohn, we have the following as the copper consumption of the leading European countries:

Copper consumption of leading European countries.

[Metric tons.]						
Country.	1893.	1894.	1895.	1896.	1897.	1898.
England.....	96,615	90,069	91,184	115,557	110,210	105,816
Germany.....	60,513	62,955	70,349	85,371	96,385	101,518
France.....	33,856	31,837	40,323	49,007	58,366	54,569
Russia.....	19,218	17,221	17,101	20,534	22,549	23,500
Austria.....	14,901	16,457	15,735	16,498	18,288	20,599
Total.....	225,103	218,539	234,692	286,967	306,798	306,002

This is exclusive of the United States, whose consumption is estimated at 101,404 metric tons in 1897, based on the returns of the American Associated Companies, and neglecting stocks, a course which is justified by the absence of any reliable data on the subject.

THE LEADING FOREIGN PRODUCERS.

The profitable character of many of the copper-mining enterprises in different parts of the world have led to unusual activity in launching new companies and reviving old concerns. Some of these are expected to become important, although few of them will contribute to the world's product during the current year. New deposits are to be opened in Spain, Mexico, Australia, Chile, and elsewhere. Among these are the Inguaran in Michoacan, Mexico, where a large plant is to

be established by French capital, and the Panuco Copper Company, Limited, near Monclova, in Coahuila, Mexico, an English enterprise.

THE SPANISH MINES.

The statistics of production of the largest foreign producer—the Rio Tinto Company—are shown in the following table for a series of years:

Pyrites and copper statistics of the Rio Tinto Company, Spain.

Year.	Pyrites extracted.				Pyrites consumed (average copper contents).		Copper produced at mines.
	For shipment.	For local treatment.	Total.	Average copper contents.			
	Tons.	Tons.	Tons.	Per cent.	Tons.	Per cent.	Tons.
1876.....	189,962	159,196	349,158	1.5	158,597	1.5	946
1877.....	251,360	520,391	771,751	2.375	211,487	2	2,495
1878.....	218,818	652,289	871,107	2.78	211,403	2.18	4,184
1879.....	243,241	663,359	906,600	2.78	236,849	2.45	7,179
1880.....	277,590	637,567	915,157	2.865	274,210	2.481	8,559
1881.....	249,098	743,949	993,047	2.75	256,827	2.347	9,466
1882.....	259,924	688,307	948,231	2.805	272,826	2.401	9,740
1883.....	313,291	786,682	1,099,973	2.956	288,104	2.387	12,295
1884.....	312,028	1,057,890	1,369,918	3.234	314,751	2.241	12,668
1885.....	406,772	944,694	1,351,466	3.102	354,501	2.27	14,593
1886.....	336,548	1,041,833	1,378,381	3.046	347,024	2.306	15,863
1887.....	362,796	819,642	1,182,438	3.047	385,842	2.283	17,813
1888.....	434,316	969,317	1,403,633	2.949	393,149	2.208	18,522
1889.....	389,943	824,380	1,214,323	2.854	395,081	2.595	18,708
1890.....	396,349	865,405	1,261,754	2.883	397,875	2.595	19,183
1891.....	464,027	972,060	1,436,087	2.649	432,532	{ 2.651 1.309 }	21,227
1892.....	406,912	995,151	1,402,063	2.819	435,758	{ 2.569 1.465 }	20,017
1893.....	477,656	854,346	1,332,002	2.996	469,339	{ 2.659 1.544 }	20,887
1894.....	498,540	888,555	1,387,095	3.027	485,441	{ 2.594 .988 }	20,606
1895.....	525,195	847,181	1,372,376	2.821	518,560	{ 2.595 .986 }	20,762
1896.....	591,752	845,580	1,437,332	2.931	549,585	{ 2.529 1.068 }	20,817
1897.....	575,733	812,293	1,388,026	2.810	582,540	{ 2.595 .967 }	20,826
1898.....	644,518	820,862	1,465,380	2.852	618,110	{ 2.600 1.023 }	20,426

The quantity of pyrites invoiced to consumers in England, Germany, and the United States was 618,110 tons in 1898, as compared with 582,540 tons in 1897, 549,585 tons in 1896, and 518,560 tons in 1895. The

production of copper was 33,882 tons in 1898, as compared with 33,924 tons in 1897. Of this quantity 20,426 tons was obtained by treatment at the mines and 13,456 tons was contained in the pyrites shipped. There was brought to market 33,095 tons in 1898, as compared with 33,431 tons in 1897. Of this 18,612 tons was sold as refined copper, 981 tons in the form of sulphate, and 13,502 tons in pyrites. The reserve heaps of the company are estimated to contain 114,708 tons of copper, the cost of which is, on the books, £4 6d. 10s. per ton fine.

Financially the company has had a very prosperous year, having at the end of the year a profit account, including balance brought forward, of £1,016,804. After writing off £9,634 on pyrites account and £10,000 on overburden account, putting aside £58,420 for redemption of 4 per cent mortgages, writing off £24,940 on plant, placing to reserve account £50,000, thus carrying it up to £190,000, there remained available for dividends £863,809. The dividends of 5 shillings per share on the preference shares and £4 7s. 6d. on common stock absorbed £850,417, leaving a balance to carry forward of £13,392.

The Tharsis Sulphur and Copper Company raised at all its mines 586,090 tons of ore, against 565,949 tons in 1897. The net profit, with a balance of £14,165, amounted to £394,129, out of which £343,750 was paid out in dividends, equal to 27½ per cent.

OTHER FOREIGN PRODUCERS.

Mason & Barry, Limited, the leading mine of Portugal, raised 169,775 tons in 1898, as compared with 177,549 tons in 1897. There was sold and invoiced for its sulphur value 284,880 tons of pyrites in 1898, as compared with 272,498 tons in 1897. The total sum available for dividends was £54,438, out of which £46,293 was paid, equal to 12½ per cent.

The Cape Copper Company operates mines at the Cape, in Norway, and at Tilt Cove, Newfoundland, and has smelting works at Briton Ferry, Wales. The reserves in the famous Ookiep mine at the Cape are dwindling. The quantity of ore raised was 26,600 tons in the last fiscal year, as compared with 26,598 tons for 1897-98, but the copper contents fell from 18.93 to 18.53 per cent. The operations at the Tilt Cove mine were successful, the profit having increased from £28,436 in 1897 to £35,725 in 1898. The total profit of the company on mines and smelting works were £218,345 in 1898, as compared with £215,283 in 1897, the dividends declared being £172,500.

The operations of the Mount Lyell Mining and Railway Company, of Tasmania, deserves particular attention, because it is the most important of the new mines of Australia and because other undertakings, like the Lyell Tharsis Mining Company and the North Mount Lyell Company, have been floated in the same district. While the company was developing, its capacity to add to the world product could not be very accurately gauged. The last report, for the six months ending

March 31, 1899, shows that 102,978 long tons of ore, dry weight, were smelted, which yielded on an average 2.74 per cent of copper, 3.25 ounces of silver, and 0.116 ounce of gold, the product having been 2,823 long tons of copper, 336,053 ounces of silver, and 11,970 ounces of gold. The company has practically completed the erection of the second smelting plant, which brings the total furnace capacity up to 1,000 tons of ore per day, equal to about 18,000,000 pounds fine per year. The cost of producing blister copper is stated to have been £1 2s. 6.36d. per ton of ore. It is interesting to note that contracts have been made to treat considerable quantities of Mount Lyell converter bars in one of the electrolytic plants of this country, the refined metal to be shipped back to England.

During the last fiscal period of six months the net profit of the Mount Lyell Company is placed at £117,545, as compared with £88,938 during the previous six months.

LEAD.

By CHARLES KIRCHHOFF.

INTRODUCTION.

During 1898 the United States attained a record production of 222,000 short tons which is about 10,000 short tons more than in 1897 when the 200,000-ton mark was first passed in our history with an output of 212,000 short tons.

An important event which has since transpired was the culmination, in 1899, of negotiations for the consolidation of the principal lead smelting and desilverizing plants in the United States under the title of the American Smelting and Refining Company, with an issue of \$27,400,000 of 7 per cent cumulative stock and \$27,400,000 of common stock outstanding. The bonded indebtedness is \$1,133,000 six per cent bonds of the Omaha and Grant Smelting Company, due March 1, 1911, and \$1,000,000 six per cent mortgage bonds of the Consolidated Kansas City Smelting and Refining Company, due May 1, 1900.

This company is the owner of all the property, rights, and assets of every kind heretofore owned by the following corporations, viz:

The United Smelting and Refining Company, Helena and Great Falls, Montana.
National Smelting Company, Chicago, Illinois.
Omaha and Grant Smelting Company, Omaha, Nebraska, and Denver, Colorado.
San Juan Smelting and Refining Company, Durango.
Pueblo Smelting and Refining Co., Pueblo, Colorado.
Colorado Smelting Company, Pueblo, Colorado.
Hanauer Smelting Works, Salt Lake City, Utah.
Pennsylvania Lead Company, Pennsylvania Smelting Company, Salt Lake City, Utah, and Pittsburg, Pennsylvania.
Globe Smelting and Refining Company, Denver, Colorado.
Bimetallie Smelting Company, Leadville, Colorado.
Germania Lead Works, Salt Lake City, Utah.
Consolidated Kansas City Smelting and Refining Company, Kansas City, Missouri, and El Paso, Texas.
Chicago and Aurora Smelting and Refining Company, Chicago and Aurora, Illinois, and Leadville, Colorado.

This list includes all the more important lead-smelting plants in the Rocky Mountain region, with the exception of the Philadelphia Smelt-

ing and Refining Company, at Pueblo, Colorado, the Tacoma Smelting and Refining Company, at Tacoma, Washington, the Puget Sound Reduction Company, at Everett, Washington, and the Selby Smelting and Lead Company, at San Francisco, California.

It includes all the desilverizing and refining plants, except that of the Selby Smelting and Lead Company and the Puget Sound Reduction Company, the latter having started a new plant in 1898, nor does it include the two tidewater plants of the Guggenheim Smelting Company, at Perth Amboy, New Jersey, and the Balbach Smelting and Refining Company, at Newark, New Jersey, both of which are almost exclusively engaged in refining foreign base bullion.

PRODUCTION.

The following series of tables present the figures of the total gross production of lead in the United States from 1825. Up to the year 1882 the figures have been compiled from the best data available. Since 1882 the statistics are those collected by this office, with the exception of the year 1889, when they were gathered by the Census Office:

Production of refined lead in the United States from 1825 to 1872, inclusive.

Year.	Production.	Year.	Production.	Year.	Production.
	<i>Short tons.</i>		<i>Short tons.</i>		<i>Short tons.</i>
1825.....	1,500	1844.....	26,000	1859.....	16,400
1830.....	8,000	1845.....	30,000	1860.....	15,600
1831.....	7,500	1846.....	28,000	1861.....	14,100
1832.....	10,000	1847.....	28,000	1862.....	14,200
1833.....	11,000	1848.....	25,000	1863.....	14,800
1834.....	12,000	1849.....	23,500	1864.....	15,300
1835.....	13,000	1850.....	22,000	1865.....	14,700
1836.....	15,000	1851.....	18,500	1866.....	16,100
1837.....	13,500	1852.....	15,700	1867.....	15,200
1838.....	15,000	1853.....	16,800	1868.....	16,400
1839.....	17,500	1854.....	16,500	1869.....	17,500
1840.....	17,000	1855.....	15,800	1870.....	17,830
1841.....	20,500	1856.....	16,000	1871.....	20,000
1842.....	24,000	1857.....	15,800	1872.....	25,880
1843.....	25,000	1858.....	15,300		

The sources from which the lead which comes into the market are drawn are numerous, and since the metal passes through a number of channels from the ore, the complications are serious. More than three-quarters of the ore mined is reduced by custom plants, and an even greater quantity is desilverized and refined, a considerable number

of the smelting plants, until recently, being controlled by interests separate from those owning the desilverizing and refining works.

We have, first, the lead produced from the nonargentiferous ores of southeast Missouri, the bulk of which is treated in smelting works controlled and owned by the mining companies themselves. This is a directly marketable product. A part of the ores and some furnace material are purchased by outside smelters, chiefly those of the St. Louis district, although at times Eastern desilverizers have drawn upon the district for smelting material.

Second, there are the lead ores raised in the zinc-lead mines of southwest Missouri and southeast Kansas, known as the Joplin-Galena district. A part of these is smelted in local works, one of them, however, marketing a certain quantity of metal annually in the form of a pigment. In Iowa a small quantity of lead ore is also smelted locally, being the product of the Dubuque district.

The lead thus obtained is directly marketable, being practically free from silver. It is known as "soft lead." In the tables of production this also includes a small amount of lead from Virginia, to which, at times, lots of metal produced in Tennessee have been added.

In former times there were some Scotch hearths in Wisconsin to treat local ores, but they have suspended work for many years.

A growing percentage of the ores of southwest Missouri and southeast Kansas, and of Wisconsin, Iowa, and Illinois, is purchased by desilverizers, by whom it is used in connection with the production of hard lead, and by lead smelters as a carrier for silver. The "soft lead" does not, therefore, represent the entire output to be credited to the Mississippi Valley.

By far the greatest quantity of lead, however, is obtained by the smelting of argentiferous lead ores mined in the Rocky Mountain region in mixture with ores of the precious metals free from lead, so-called "dry ores," which lead smelters can handle more economically than they can be treated locally by amalgamation or by other processes used for the extraction of gold and silver. Practically the lead in these ores has become the carrier for the precious metals in the "dry" ores, and, generally speaking, it may be stated that the offerings of "dry" ores have usually been so heavy for many years that suitable lead ores always find eager buyers. There are a few lead smelting plants, relatively unimportant, in Idaho, Montana, New Mexico, and California, built to reduce the ores locally-mined. The great mass of the ores, however, are hauled often great distances to meet the fuel and to encounter ores carrying the precious metals. The principal large plants are in Colorado, Utah, and Montana. An excellent illustration of this movement is afforded by the famous Cœur d'Alene district in Idaho, which yields over one-quarter of the lead mined in the United States. Not a pound is smelted locally, the concentrates and ore being shipped for reduction

to the smelters in Colorado, Montana, Utah, Nebraska, Illinois, and the Puget Sound.

From 1873 to 1885, inclusive, the production was separated into the two groups, that of desilverized lead obtained from smelting argentiferous ores drawn from the Rocky Mountain region and that of the "soft lead" from the nonargentiferous ores of the Mississippi Valley.

Production of refined lead in the United States from 1873 to 1885.

Year.	Total production. (a)	Desilverized lead. (a)	Soft lead. (b)	Net American product.
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
1873.....	42,540	20,159	22,381	42,540
1874.....	52,080			52,080
1875.....	59,640	34,909	24,731	59,640
1876.....	64,070	37,649	26,421	64,070
1877.....	81,900	50,748	31,152	81,900
1878.....	91,060	64,290	26,770	91,060
1879.....	92,780	64,660	28,130	92,780
1880.....	97,825	70,135	27,690	97,825
1881.....	117,085	86,315	30,770	117,085
1882.....	132,890	103,875	29,015	132,890
1883.....	143,957	122,157	21,800	143,957
1884.....	139,897	119,965	19,932	139,897
1885.....	129,412	107,437	21,975	129,412

a Including foreign base bullion refined in bond.

b Including a small quantity of lead produced in the Southern States.

In 1886, however, another source of lead began to assume importance and became a factor, introducing complications. The smelters of the Rocky Mountain region, some of the desilverizers, and a number of border plants began to draw largely, first upon Mexico, and later upon British Columbia, for growing quantities of argentiferous lead ores. Before the advent of these supplies the product of the American mines was easily arrived at by adding together the desilverized and the soft lead. From 1886 on the third table was prepared, and for a series of years the lead production was held to be the total output, deducting the lead contents of the foreign ores smelted.

Later on the refining in bond of foreign base bullion became an important industry. Varying quantities of the metal so produced were retained in this country for home consumption.

A certain quantity was "exempt" from payment of duty as representing the metallurgical loss, and varying amounts are entered for domestic consumption by the payment of duty. The overlapping of receipts and shipments from one year to the other and the time required for the completion of the treatment of the material to the marketable

product introduced uncertainties which rendered unreliable the simple and direct method of deducting from the total product of refined lead the estimated lead contents of the foreign material imported during the year.

Since it was also deemed highly desirable to ascertain as closely as possible the source, territorially, of our home product, the system was adopted of ascertaining, through the smelters, the quantities of lead in the ores worked by them from different States and Territories. From these returns the estimates of the domestic product have been made which appear in the following table, in the last column, the system having been adopted in 1894:

Production of refined lead in the United States from 1886 to 1898.

Year.	Total produc- tion. (a)	Desilverized lead. (a)	Soft lead. (b)	From foreign ores and base bullion.	Net American product.
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
1886.....	135,629	114,829	20,800	c 5,000	c 130,629
1887.....	160,700	135,552	25,148	c 15,000	c 145,700
1888.....	180,555	151,465	29,090	28,636	151,919
1889.....	182,967	153,709	29,258	26,570	156,397
1890.....	161,754	130,403	31,351	18,124	143,630
1891.....	202,406	171,009	31,397	23,852	178,554
1892.....	213,263	181,584	31,678	39,957	173,305
1893.....	229,333	196,820	32,513	65,351	163,982
1894.....	219,090	181,404	37,686	59,739	d 162,686
1895.....	241,882	201,992	39,890	76,173	d 170,000
1896.....	264,994	221,457	43,537	77,738	d 188,000
1897.....	291,036	247,483	43,553	83,671	d 212,000
1898.....	310,621	267,842	42,779	99,945	d 222,000

a Including foreign base bullion refined in bond.

b Including a small quantity of lead produced in the Southern States.

c Estimated.

d Arrived at from direct returns from smelters.

Hard lead.—Since 1891 special returns from desilverizers have been made on the quantity of antimonial or hard lead produced. The quantity was 4,043 tons in 1891, 5,039 tons in 1892, and 5,013 tons in 1893. In 1896 the production of hard lead was 7,507 tons, rising to 8,867 tons in 1897, and declining again to 8,473 tons in 1898.

SOURCES OF LEAD.

Since 1894, through the courteous cooperation of the lead smelters and refiners, returns have been received showing the lead contents of the ores smelted by them and which were obtained from mines in the United States:

Lead contents of ores smelted by the works in the United States.

State or Territory.	1894.	1895.	1896.	1897.	1898.
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
Colorado	50,613	46,984	44,803	40,576	57,352
Idaho	33,308	31,638	46,662	58,627	59,142
Utah	23,190	31,305	35,578	40,537	39,299
Montana	9,637	9,802	11,070	12,930	10,745
New Mexico	2,973	3,040	3,461	9,123	5,797
Nevada	2,254	2,583	1,173	959	4,714
Arizona	1,480	2,053	1,165	2,184	2,224
California	478	949	691	383	482
Washington, Oregon, Alaska, South Dakota, Texas	150	381	1,006	638	1,349
Missouri, Kansas, Wisconsin, Illinois, Iowa, Virginia	46,300	53,596	51,887	56,542	54,469
Total lead contents American ores smelted	170,383	182,331	197,496	222,499	235,573
Contents Mexican ores	a 21,000	16,437	15,403	13,430	10,520
Contents Canadian ores		5,040	10,100	19,515	17,377
Contents miscellaneous or unknown			2,118	344	428

a Estimated.

The figures presented for Missouri, Kansas, etc., are an aggregate of two sets of returns, one the actual pig lead made by local smelters, usually reported, as above, as soft lead, and the other the lead contents of ores, concentrates, and furnace products purchased by smelters of argentiferous ores and by desilverizers. According to the returns the latter handled ores from Missouri and Kansas containing 10,308 short tons of lead, from Wisconsin carrying 1,173 tons of lead, and from Illinois 207 tons of lead.

In estimating the actual lead product obtainable from the ores thus smelted the "soft lead" must be deducted. Then the allowance must be made on the balance for waste in smelting and desilverizing. For the year 1898 the results are as follows: The lead contents of ores

smelted, deducting 42,779 short tons of soft lead, amounted to 192,794 short tons. Deducting 7 per cent for loss in smelting, desilverizing, and refining, and for loss in copper-lead matte, we have 179,298 tons from American ores. Adding the 42,779 short tons of soft lead, we reach a total of 222,077 short tons. Based on these figures this office accepts 222,000 short tons as the product of lead produced by the mines of the United States during the year 1898.

Another method of reaching the net American product is the following: The total product of desilverized lead was 267,827 short tons. Deducting 97 per cent of the quantity of base bullion (70,621 tons) refined in bond, or 68,503 short tons, and 93 per cent of the lead contents (28,342 short tons) of the foreign ores smelted, or 26,258 tons, we have 183,066 short tons as the lead of domestic origin represented in the desilverized lead. Add to this 42,779 tons of soft lead, and a total of 225,845 tons is reached as representing the product of the United States.

The method based upon the smelters' returns is given the preference, because the smelter is closer to the source of the production and therefore much more accurately reflects the output of the mines. For compact districts, in which the operations are conducted by large mining companies, it is possible to arrive at close estimates of the lead contents of the ores or concentrates. But nothing short of an elaborate, expensive, and yet untrustworthy census of thousands of small and scattered mines would make it possible to arrive at the production of lead through the ore.

For the statistics of output we must therefore rely upon the smelters, and we are dependent upon them for the data which enable the statistician to trace the lead output to its source territorially.

So far as the statistics bearing on the marketable supply of the metal are concerned, the records of the desilverizing plants must be the guide, since the refiner stands closest to the consumer. His returns, therefore, are the important ones from the commercial point of view.

DOMESTIC PRODUCERS.

As the returns from the smelting works prove, the heaviest increase during 1898 over 1897 has been in Colorado. Only a part of this is due to the recovery in the Leadville district from the strike of 1897. The Herald-Democrat compiles statistics showing that the lead contents of ores smelted by Leadville and by outside smelters in 1898 was 17,456 short tons, as compared with 13,278 tons in 1897 and 31,236 tons in 1895. In other words, the other districts of Colorado have been rapidly developing, until they overshadow the Leadville district, which in 1895 produced close to 70 per cent of the total, but in 1898 was down to 30 per cent.

The Creede district in Mineral County is again coming forward as a producer of lead. Plans for the unwatering of a number of mines are

being carried forward. For 1898 the lead contents of the ore shipments are placed at about 7,500 tons, and an increase is expected. Increased shipments are credited to the San Juan country, and Aspen has gained new life through the concentration of low-grade ores.

The output of Idaho has been chiefly that of the Cœur d'Alene district, the older regions contributing only a small quantity, relatively. The district, with its concentrates rich in lead, is the main reliance of the smelters in Colorado, Montana, and Washington.

It may be of interest to show in the following table the source of the lead in ores smelted in 1897 and in 1898 by what are generally known as the "valley smelters," those at Pueblo and at Denver.

Source of lead in ores smelted by valley smelters in 1897 and 1898.

	1897.	1898.
	<i>Pounds.</i>	<i>Pounds.</i>
Colorado	55,850,292	98,833,984
Idaho	70,236,742	70,919,445
Utah	22,708,918	32,355,433
Montana	3,597,023	194,953
Arizona	1,330,155	2,316,711
California	209,243	53,520
New Mexico	809,019	635,744
Nevada	53,277	678,960
Washington		1,011,400
Missouri and Kansas	895,696	
Mexico and Canada	17,841,602	12,486,033

In California a new plant was started in 1898 by the Inyo County Mining and Development Company, of Darwin, which made a trial run of two months during the year.

In New Mexico the principal local smelting plant is that of the Graphic mines and smelting works at Magdalena, the El Paso works of the Consolidated Kansas City Smelting and Refining Company treating the bulk of the lead ores mined in the Territory.

In Montana the Hecla Consolidated Mining Company made a slight increase in its output. A large new smelting plant has been completed at Twin Bridges, Montana.

The increase in the output of Nevada is due to larger shipments of ore to the Utah smelters.

While the output of the mines of Utah was practically stationary, having been 39,299 short tons in 1898 as compared with 40,537 tons in 1897, the Salt Lake smelters did not handle as large a proportion of it in 1898 as they did in 1897. In the latter year they treated Utah ores carrying 26,233 short tons of lead. In 1898 this had declined to 21,612 short tons.

There has been a good deal of activity in the direction of preparing for an increased output in southeast Missouri, which did not, however, tell on the production of 1898, because elaborate equipment and development is necessary. Formerly practically all of the ore mined in the district was converted into metal on the spot, so that the product was very readily traceable. Now considerable quantities of concentrates are shipped to distant smelters, principally those in the St. Louis district; therefore the local output of pig lead no longer measures the productiveness of the district. It may be interesting to note, however, that the local pig-lead production of the four large concerns, the St. Joseph Lead Company, the Mine La Motte estate, the Desloge Consolidated Lead Company, and the Central Lead Company, aggregated in 1898 27,444 short tons as compared with 31,231 short tons in 1897.

The Desloge Consolidated Lead Company has been making improvements; the Central Lead Company has acquired and is developing the property of the Theodora Lead Company; the National Lead Company has been preparing for production, and the Union Lead Company, the Elizabeth Lead Company, and the Columbia Lead Company have been organized to open new territory. The old Palmer mines, in Washington County, are now operated by the Renault Lead Company.

The Joplin-Galena district showed some falling off in its production of lead ore, although the output of zinc ore increased very heavily. The total sales for the year were 26,475 short tons, as compared with 29,578 short tons in 1897.

The average monthly prices for lead ore are reported as follows, per 1,000 pounds:

Average prices of lead ore in the Joplin-Galena district, per 1,000 pounds.

Month.	Price.	Month.	Price.
January	\$22.00	July	\$23.60
February	22.12½	August	23.50
March	23.00	September	23.31½
April	21.56½	October	22.00
May	21.75	November	20.87½
June	22.87½	December	21.10

The local smelters, the Picher Lead Company, the Granby Mining and Smelting Company, J. B. Serage, the Case Lead Company, and the Galena Empire Lead Smelting Company, produced, in 1898, 6,869 short tons of lead, as compared with 6,975 short tons in 1897.

The principal producing camps in 1898 were Joplin, with 8,329 short tons of lead ore; Galena, with 7,878 tons; Cartersville, with 4,246 tons, and Duenweg, with 2,194 tons.

PRODUCTION OF REFINED LEAD.

The total production of marketable lead in the United States in 1898 was 310,621 short tons, as compared with 291,036 short tons in 1897, this including the total amount of the metal from domestic and foreign sources. Of this a large quantity was exported, leaving the balance available for home consumption.

Since 1894, returns have been collected semiannually, the results being embodied in the following tables:

Comparison of half-yearly periods.

	1894.		1895.		1896.	
	First half.	Second half.	First half.	Second half.	First half.	Second half.
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
Desilverized lead.....	86,772	94,632	87,957	114,035	109,592	111,865
Soft lead.....	15,610	22,076	18,013	21,877	21,103	23,434
Total production refined lead.....	102,382	116,708	105,970	135,912	130,695	134,299
Exported:						
Base bullion, refined in bond.....	21,392	17,243	17,458	37,238	26,119	25,656
Ores, smelted in bond.....						
Available for home consumption.....	80,990	99,465	88,512	98,674	104,576	108,643
	1897.		1898.			
	First half.	Second half.	First half.	Second half.		
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>		
Desilverized lead.....	111,838	135,645	131,188	136,654		
Soft lead.....	21,621	21,932	24,486	18,293		
Total production refined lead.....	133,459	157,577	155,674	154,947		
Exported:						
Base bullion, refined in bond.....	26,838	25,431	33,439	38,182		
Ores, smelted in bond.....	2,720	7,420	7,308	5,737		
Available for home consumption.....	103,901	124,726	114,927	111,028		

It will be observed that during the years 1894, 1895, 1896, and 1897 there was regularly a greater or less increase in the production and in the available supply during the second half as compared with the first six months of the respective years. In 1898 the same apparent law was observed as to the production, but the supply available for home consumption declined, thus furnishing an exception to the rule.

The exports reported in the above table are from the direct returns of producers. They do not agree with the figures compiled by the Bureau of Statistics.

CONSUMPTION.

Based on the data at hand, the following estimate is presented of the consumption of lead in recent years. The figures representing domestic stocks are aggregates of returns received by this office. They are not, however, complete:

Estimate of the consumption of lead in the United States from 1894 to 1898.

	1894.	1895.	1896.	1897.	1898.
Supply—					
Total product desilverized lead	Short tons. 181,404	Short tons. 201,992	Short tons. 221,457	Short tons. 247,483	Short tons. 267,827
Soft lead	37,686	39,890	43,537	43,553	42,779
Imports, foreign refined.	8,200	22,947	2,020	2,000	437
Stock, domestic, beginning of year	7,496	8,586	9,557	9,299	17,608
Stock, foreign in bond, beginning of year	3,302	7,181	9,865	4,124	6,691
Total supply	238,088	280,596	286,436	306,459	335,342
Deduct—					
Foreign base bullion and ores refined in bond and exported...	29,000	18,130	57,612	62,409	84,666
Lead in manufactures exported under drawback	950	2,000	1,500	500	1,200
Stock, domestic, close of year	8,586	9,557	9,299	17,608	14,683
Stock, foreign in bond..	7,181	9,865	4,124	6,694	7,341
Total	45,717	39,552	72,535	87,211	107,890
Consumption	192,371	241,044	213,901	219,248	227,452

There has therefore been a moderate increase in the consumption in spite of the fact that some of the leading interests, notably the white lead industry, did not show any expansion as compared with the previous year.

During the whole of the year the prices in the domestic market were too low, relatively, to allow any important quantity of base bullion refined in bond to be retained in this country.

The reports of the Bureau of Statistics are apparently conflicting. The imports of lead in ore and base bullion, by countries of origin, are given as 141,656,999 pounds from Mexico, 36,253,657 pounds from British Columbia, and minor quantities from Chili and Peru, carrying the total to 178,389,528 pounds, or 89,195 short tons. Yet the reports from the works in this country show that they handled nearly 100,000 tons of lead in plumbiferous material.

A statement of the imports of lead in ore and base bullion in 1898, showing warehouse transactions, may be summarized as follows:

	Pounds.
In warehouse January 1, 1898	13, 888, 372
Entered warehouse:	
Of direct importation	170, 017, 006
From other districts	177, 837, 309
Additions by liquidation	1, 326, 934
Withdrawn from warehouse:	
For exportation	147, 978, 938
For transportation	163, 405, 296
For consumption	7, 844, 184
Deductions by liquidation	28, 650, 385
In warehouse January 1, 1899	14, 682, 984

The meaning of these figures can not be explained. As a matter of fact, a much larger quantity of lead than that stated has been exported.

The following special statement has been prepared by the Bureau of Statistics to show the quantity of lead on which drawbacks have been paid:

Lead exported on which drawbacks have been paid in 1898.

Ports.	Quantity.	Drawbacks paid.
	Pounds.	
Boston	1, 168	\$21. 53
New Haven	39, 662	392. 69
New York	1, 889, 587	31, 624. 52
Delaware	103	2. 17
Philadelphia	148, 906	3, 132. 62
Newport News	1, 931	27. 12
Kansas City	8, 198, 120	121, 742. 28
San Francisco	239, 019	2, 195. 31
Total	10, 518, 516	159, 138. 24

IMPORTS AND EXPORTS.

The following tables are from the records of the Bureau of Statistics:

Lead imported and entered for consumption in the United States, 1867 to 1898.

Year ending—	Ore and dross.		Pigs and bars.	
	Quantity.	Value.	Quantity.	Value.
June 30—	Pounds.		Pounds.	
1867.....	611	\$25	65,322,923	\$2,812,668
1868.....	6,945	230	63,254,677	2,668,915
1869.....			87,865,471	3,653,481
1870.....	5,973	176	85,895,724	3,530,837
1871.....	316	10	91,496,715	3,721,096
1872.....	32,231	1,425	73,086,657	2,929,623
1873.....			72,423,641	3,233,011
1874.....			46,205,154	2,231,817
1875.....	13,206	320	32,770,712	1,559,017
1876.....			14,329,366	682,132
1877.....	1,000	20	14,583,845	671,482
1878.....			6,717,032	294,233
1879.....			1,216,500	42,983
1880.....			6,723,706	246,015
1881.....	5,981	97	4,322,068	159,129
1882.....	21,698	500	6,079,304	202,603
1883.....	600	17	4,037,867	130,108
1884.....	419	13	3,072,738	85,395
1885.....	4,218	57	5,862,474	143,103
1886.....	715,588	9,899	17,582,298	491,310
December 31—				
1887.....	153,731	21,487	7,716,783	219,770
1888.....	88,870	2,468	2,582,236	69,891
1889.....	328,315	7,468	2,773,622	76,243
1890.....	11,065,865	504,067	19,336,233	593,671
1891.....	40,692,478	1,120,067	3,392,562	104,184
1892.....	54,249,291	1,278,114	1,549,771	110,953
1893.....	58,487,319	1,004,296	3,959,781	129,290
1894.....	33,020,250	437,999	39,168,529	895,496
1895.....	45,050,674	687,222	109,551,082	2,052,209
1896.....	37,829,583	631,381	10,551,148	191,479
1897.....	31,036,882	535,094	13,050,987	314,549
1898.....	16,610,607	331,116	311,502	8,787

Lead imported and entered for consumption in the United States, 1867 to 1898—Continued.

Year ending—	Sheets, pipe, and shot.		Shot.		Not otherwise specified.	Total value.
	Quantity.	Value.	Quantity.	Value.		
June 30—	<i>Pounds.</i>		<i>Pounds.</i>			
1867.....	185, 825	\$9, 560	.....	.....	\$6, 222	\$2, 828, 475
1868.....	142, 137	7, 229	.....	.....	6, 604	2, 682, 987
1869.....	307, 424	15, 531	.....	.....	18, 885	3, 687, 897
1870.....	141, 681	6, 879	.....	.....	10, 444	3, 548, 336
1871.....	86, 712	4, 209	.....	.....	8, 730	3, 734, 045
1872.....	15, 518	859	.....	.....	20, 191	2, 952, 098
1873.....	105	12	420	\$50	21, 503	3, 254, 576
1874.....	.....	.....	30, 219	1, 349	36, 484	2, 269, 650
1875.....	.....	.....	58	4	25, 774	1, 585, 115
1876.....	.....	.....	20, 007	1, 204	27, 106	710, 442
1877.....	.....	.....	16, 502	1, 242	1, 041	673, 785
1878.....	.....	.....	15, 829	963	113	295, 309
1879.....	.....	.....	3, 748	209	980	44, 122
1880.....	.....	.....	1, 120	54	371	246, 440
1881.....	.....	.....	900	65	1, 443	160, 734
1882.....	.....	.....	1, 469	99	2, 449	205, 651
1883.....	.....	.....	1, 510	79	8, 030	138, 234
1884.....	15, 040	630	.....	.....	1, 992	88, 030
1885.....	971, 951	22, 217	.....	.....	1, 372	166, 749
1886.....	27, 357	1, 218	.....	.....	964	503, 191
December 31—						
1887.....	27, 941	1, 286	.....	.....	302	242, 845
1888.....	23, 103	1, 202	.....	.....	977	74, 538
1889.....	35, 859	1, 417	.....	.....	1, 297	86, 425
1890.....	91, 660	5, 591	.....	.....	1, 136	1, 104, 465
1891.....	334, 179	12, 406	.....	.....	604	1, 237, 467
1892.....	90, 135	6, 207	.....	.....	2, 063	1, 397, 337
1893.....	59, 798	2, 955	.....	.....	1, 691	1, 138, 231
1894.....	44, 080	2, 050	.....	.....	536	1, 336, 081
1895.....	128, 008	5, 030	.....	.....	1, 277	2, 745, 738
1896.....	96, 010	3, 818	.....	.....	644	827, 322
1897.....	95, 891	4, 042	.....	.....	513	854, 198
1898.....	242, 759	9, 389	.....	.....	312	349, 604

LEAD.

235

*Old and scrap lead imported and entered for consumption in the United States,
1867 to 1889.*

Year ending—	Quantity.	Value.	Year ending—	Quantity.	Value.
June 30—	Pounds.		June 30—	Pounds.	
1867.....	1,256,233	\$53,202	1880.....	213,063	\$5,262
1868.....	2,165,575	101,586	1881.....	123,018	2,729
1869.....	2,983,272	123,068	1882.....	220,702	5,949
1870.....	3,756,785	150,379	1883.....	1,094,133	31,724
1871.....	2,289,688	94,467	1884.....	160,356	4,830
1872.....	4,257,778	171,324	1885.....	4,866	106
1873.....	3,545,098	151,756	December 31—		
1874.....	395,516	13,897	1886.....	24,726	882
1875.....	392,150	13,964	1887.....	136,625	4,323
1876.....	265,860	9,534	1888.....	33,100	904
1877.....	249,645	8,383	1889.....	50,816	1,494
1878.....	106,342	3,756	1890.....	(a)	(a)
1879.....	42,283	1,153			

a Included in pigs and bars after 1889.

Lead, and manufactures of lead, of domestic production, exported from the United States.

Year ending—	Manufactures of—			Pigs, bars, and old.		Total value.
	Lead.		Pewter and lead.	Quantity.	Value.	
	Quantity.	Value.	Value.			
September 30—	Pounds.			Pounds.		
1790.....	13, 440	\$810				\$810
1803.....	a 900					
1804.....	19, 804					
1805.....	8, 000					
1808.....	40, 583					
1809.....	126, 537					
1810.....	172, 323					
1811.....	65, 497					
1812.....	74, 875					
1813.....	276, 940					
1814.....	43, 600					
1815.....	40, 245					
1816.....	35, 844					
1817.....	111, 034	9, 993				9, 993
1818.....	281, 168	22, 493				22, 493
1819.....	94, 362	7, 549				7, 549
1820.....	25, 699	1, 799				1, 799

a Barrels.

Lead, and manufactures of lead, of domestic production, exported from the United States—
Continued.

Year ending—	Manufactures of—			Pigs, bars, and old.		Total value.
	Lead.		Pewter and lead.			
	Quantity.	Value.	Value.	Quantity.	Value.	
September 30—	<i>Pounds.</i>			<i>Pounds.</i>		
1821.....	56, 192	\$3, 512				\$3, 512
1822.....	66, 316	4, 244				4, 244
1823.....	51, 549	3, 098				3, 098
1824.....	18, 604	1, 356				1, 356
1825.....	189, 930	12, 697				12, 697
1826.....	47, 337	3, 347	\$1, 820			5, 167
1827.....	50, 160	3, 761	6, 183			9, 944
1828.....	76, 882	4, 184	5, 545			9, 729
1829.....	179, 952	8, 417	5, 185			13, 602
1830.....	128, 417	4, 831	4, 172			9, 003
1831.....	152, 578,	7, 068	6, 422			13, 490
1832.....	72, 439	4, 483	983			5, 466
1833.....	119, 407	5, 685	2, 010			7, 695
1834.....	13, 480	805	2, 224			3, 029
1835.....	50, 418	2, 741	433			3, 174
1836.....	34, 600	2, 218	4, 777			6, 995
1837.....	297, 488	17, 015	3, 132			20, 147
1838.....	375, 231	21, 747	6, 461			28, 208
1839.....	81, 377	6, 003	12, 637			18, 640
1840.....	882, 620	39, 687	15, 296			54, 983
1841.....	2, 177, 164	96, 748	20, 546			117, 294
1842.....	14, 552, 357	523, 428	16, 789			540, 217
June 30—						
1843 (a)	15, 366, 918	492, 765	7, 121			499, 886
1844.....	18, 420, 407	595, 238	10, 018			605, 256
1845.....	10, 188, 024	342, 646	14, 404			357, 050
1846.....	16, 823, 766	614, 518	10, 278			624, 796
1847.....	3, 326, 028	124, 981	13, 694			138, 675
1848.....	1, 994, 704	84, 278	7, 739			92, 017
1849.....	680, 249	30, 198	13, 196			43, 394
1850.....	261, 123	12, 797	22, 682			35, 479
1851.....			16, 426	229, 448	\$11, 774	28, 200
1852.....			18, 469	747, 930	32, 725	51, 194
1853.....			14, 064	100, 778	5, 540	19, 604
1854.....			16, 478	404, 247	26, 874	43, 352
1855.....			5, 233	165, 533	14, 298	19, 531

a Nine months.

Lead, and manufactures of lead, of domestic production, exported from the United States—
Continued.

Year ending—	Manufactures of—					Total value.
	Lead.		Pewter and lead.	Pigs, bars, and old.		
	Quantity.	Value.	Value.	Quantity.	Value.	
June 30—	Pounds.			Pounds.		
1856.....			\$5, 628	310, 029	\$27, 512	\$33, 140
1857.....			4, 818	870, 544	58, 624	63, 442
1858.....			27, 327	900, 607	48, 119	75, 446
1859.....			28, 782	313, 988	28, 575	57, 357
1860.....			56, 081	903, 468	50, 446	106, 527
1861.....			30, 534	109, 023	6, 241	36, 775
1862.....			28, 832	79, 231	7, 334	36, 166
1863.....			30, 609	237, 239	22, 634	53, 243
1864.....			30, 411	223, 752	18, 718	49, 129
1865.....			29, 271	852, 895	132, 666	161, 937
1866.....			44, 483	25, 278	2, 323	46, 806
1867.....			27, 559	99, 158	5, 300	32, 859
1868.....			37, 111	438, 040	34, 218	71, 329
1869.....			17, 249			17, 249
1870.....		\$28, 315				28, 315
1871.....		79, 880				79, 880
1872.....		48, 132				48, 132
1873.....		13, 392				13, 392
1874.....		302, 044				302, 044
1875.....		429, 309				429, 309
1876.....		102, 726				102, 726
1877.....		49, 835				49, 835
1878.....		314, 904				314, 904
1879.....		280, 771				280, 771
1880.....		49, 899				49, 899
1881.....		39, 710				39, 710
1882.....		178, 779				178, 779
1883.....		43, 108				43, 108
1884.....		135, 156				135, 156
1885.....		123, 466				123, 466
December 31—						
1886.....		136, 666				136, 666
1887.....		140, 065				140, 065
1888.....		194, 216				194, 216
1889.....		161, 614				161, 614
1890.....		181, 030				181, 030
1891.....		173, 887				173, 887

Lead, and manufactures of lead, of domestic production, exported from the United States—
Continued.

Year ending -	Manufactures of—			Pigs, bars, and old.		Total value.
	Lead.		Pewter and lead.			
	Quantity.	Value.	Value.	Quantity.	Value.	
December 31—	Pounds.			Pounds.		
1892.....		\$154, 375				\$154, 375
1893.....		508, 090				508, 090
1894.....		456, 753			a\$41, 240	497, 993
1895.....		164, 083		1, 696, 879	50, 773	214, 856
1896.....		164, 877		b 16, 359, 452	442, 496	607, 373
1897.....	{ c 150, 473	d 49, 816	{	b 7, 725, 624	223, 037	433, 319
	{ e 160, 466					
1898.....	{ c 265, 209	d 97, 867	{	250, 872	8, 406	215, 239
	{ e 108, 966					

a Not enumerated between 1868 and July 1, 1894.

b Part of this is foreign lead returned by collectors of customs by mistake as domestic lead.

c Type.

d Value of type.

e Value of all other manufactures.

From records kept by Mr. A. E. Caswell, of New York, the imports of lead during the calendar years from 1860 to 1888, both inclusive, were as follows, the official figures in the table presented covering only fiscal years to 1886:

Imports of lead in calendar years from 1860 to 1888.

Year.	In pigs.	In ores.	Total.
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
1860.....	21,425		21,425
1861.....	15,720		15,720
1862.....	32,900		32,900
1863.....	12,600		12,600
1864.....	27,900		27,900
1865.....	13,600		13,600
1866.....	27,200		27,200
1867.....	23,330		23,330
1868.....	23,225		23,225
1869.....	35,111		35,111
1870.....	28,600		28,600
1871.....	28,000		28,000
1872.....	26,355		26,355
1873.....	22,114		22,114
1874.....	17,674		17,674
1875.....	7,305		7,305
1876.....	4,685		4,685
1877.....	745		745
1878.....	285		285
1879.....	2,461		2,461
1880.....	3,228		3,228
1881.....	3,492		3,492
1882.....	2,518		2,518
1883.....	1,085		1,085
1884.....	2,508		2,508
1885.....	2,682		2,682
1886.....	9,760	8,800	18,560
1887.....	4,312	15,060	19,372
1888.....	1,642	27,018	28,660

According to the returns of the Treasury Department, the imports of lead in the calendar years 1894, 1895, 1896, 1897, and 1898 were as follows:

Sources of imports of lead.

Country.	1894.	1895.	1896.	1897.	1898.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>
United Kingdom ..	6,357,937	8,161,411	1,365,132	1,120,528	322,167
Germany	1,792,305	1,113,148	.....	.....	.....
Other Europe	14,452,179	36,618,228	1,235,981	1,101,151	.....
Total refined pig lead	22,602,421	45,892,787	2,601,113	2,221,679	322,167
British North America	4,969,993	15,860,906	25,672,833	44,171,421	36,255,163
Mexico	112,148,130	138,312,146	130,388,173	137,364,677	142,205,851
Total ore and base bullion ..	117,118,123	154,173,052	156,061,006	181,536,098	178,461,014
Other countries. .	241,367	931,116	1,656,398	1,560,635	482,800
Total imports .	139,961,911	200,996,955	160,318,517	185,318,412	179,265,981

The subdivision by groups representing refined pig lead, and lead in ore, and base bullion is made by this office.

WAREHOUSE TRANSACTIONS.

The following table shows the warehouse transactions of lead in ore and in base bullion, monthly, during 1898, and the corresponding totals for the year 1897. It will be observed how much the withdrawals from warehouse for exportation have been increased and how heavily the quantities withdrawn for consumption have declined. An interesting feature of the table is the very large increase in the deductions by liquidation, comparing 1898 with 1897.

Imports of lead in ore and base bullion in 1898, showing warehouse transactions, by months.

Month.	Remaining in warehouse first day of each month.	Entered warehouse—		Additions by liquidation.
		Of direct importation.	From other districts.	
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>
January, 1898	13, 388, 372	17, 389, 632	17, 759, 261	4, 964
February, 1898 ...	17, 218, 214	16, 236, 493	19, 267, 328	374, 349
March, 1898.....	17, 147, 034	16, 463, 365	21, 011, 063	757
April, 1898.....	16, 127, 752	11, 577, 895	13, 709, 034	67, 195
May, 1898	11, 303, 772	9, 492, 366	6, 449, 276	422, 350
June, 1898	9, 032, 101	8, 525, 102	14, 615, 276	124, 364
July, 1898	8, 532, 967	11, 797, 597	11, 406, 168	-----
August, 1898.....	6, 848, 029	21, 353, 239	10, 677, 756	312, 102
September, 1898 ..	9, 955, 231	10, 652, 745	16, 959, 442	-----
October, 1898	11, 579, 321	15, 662, 538	14, 452, 332	8, 236
November, 1898 ...	11, 623, 162	12, 860, 100	16, 702, 744	8, 475
December, 1898 ...	15, 825, 575	18, 005, 934	14, 827, 606	4, 142
January 1, 1899...	14, 662, 984	-----	-----	-----
Total, 1898	-----	170, 017, 006	177, 837, 309	1, 326, 934
Total, 1897	8, 248, 129	163, 365, 627	167, 963, 673	305, 862

Month.	Withdrawn from warehouse—			Deductions by liquidation.
	For exportation.	For transportation.	For consumption.	
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>
January, 1898	10, 583, 022	19, 091, 511	685, 948	963, 534
February, 1898 ...	14, 567, 544	19, 396, 651	410, 397	1, 574, 758
March, 1898.....	17, 742, 346	17, 229, 656	781, 339	2, 741, 146
April, 1898.....	11, 913, 194	13, 149, 925	574, 750	4, 540, 235
May, 1898	10, 743, 699	6, 208, 910	458, 103	1, 224, 951
June, 1898	11, 172, 616	8, 839, 537	720, 433	3, 023, 459
July, 1898	9, 837, 666	11, 780, 699	531, 930	2, 738, 408
August, 1898.....	10, 594, 946	16, 873, 787	540, 062	1, 227, 100
September, 1898 ..	13, 349, 200	11, 044, 702	686, 878	907, 317
October, 1898	11, 687, 302	16, 559, 880	404, 290	1, 427, 793
November, 1898...	14, 655, 935	5, 700, 064	687, 298	4, 325, 609
December, 1898 ...	11, 131, 468	17, 529, 974	1, 362, 756	3, 956, 075
January 1, 1899...	-----	-----	-----	-----
Total, 1898	147, 978, 938	163, 405, 296	7, 844, 184	28, 650, 385
Total, 1897	109, 847, 156	183, 006, 461	23, 929, 569	7, 769, 593

PRICES.

The following table gives the highest and lowest prices monthly for a series of years, compiled from market quotations:

Highest and lowest prices of lead at New York City, monthly, from 1870 to 1898, inclusive.

[Cents per pound.]

Year.	January.		February.		March.		April.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
1870.....	a 6.30	6.20	6.25	6.17	6.20	6.10	6.25	6.15
1871.....	a 6.30	6.15	6.25	6.20	6.20	6.15	6.20	6.10
1872.....	a 6	5.90	6	5.87	6	5.87	6.12	5.90
1873.....	a 6.37	6.25	6.50	6.40	6.50	6.25	6.50	6.25
1874.....	a 6	5.90	6.25	6	6.25	6.12	6.25	5.90
1875.....	a 6.20	6	5.90	5.85	5.75	5.62	5.87	5.80
1876.....	a 6	5.87	6.37	6	6.50	6.40	6.40	6.12
1877.....	b 6.15	6.12	6.40	6.20	6.75	6.50	6.50	6.25
1878.....	4.35	4	3.87	3.65	3.87	3.62	3.75	3.50
1879.....	4.50	4	4.50	4.50	4.50	3.25	3.25	2.87
1880.....	6.10	5.50	6	5.87	5.95	5.30	5.75	5.40
1881.....	5	4.30	5.10	4.80	4.85	4.62	4.85	4.37
1882.....	5.15	4.95	5.20	5	5.12	4.85	5	4.90
1883.....	4.70	4.60	4.60	4.50	4.65	4.50	4.62	4.40
1884.....	4.50	3.75	4.10	3.75	4.15	4.10	4.05	3.62½
1885.....	3.70	3.55	3.70	3.60	3.70	3.62½	3.70	3.62½
1886.....	4.70	4.50	4.90	4.60	4.95	4.85	4.90	4.65
1887.....	4.45	4.15	4.50	4.25	4.45	4.25	4.32½	4.20
1888.....	4.90	4.50	5.15	4.60	5.25	5	5.05	4.55
1889.....	3.90	3.75	3.75	3.60	3.75	3.65	3.67½	3.60
1890.....	3.85	3.80	3.85	3.75	3.95	3.85	4.07½	3.85
1891.....	4.50	4.05	4.50	4.25	4.37½	4.25	4.32½	4.10
1892.....	4.30	4.10	4.25	4.05	4.22½	4.10	4.30	4.20
1893.....	3.90	3.85	3.95	3.90	4.05	3.85	4.12½	4.05
1894.....	3.25	3.15	3.35	3.20	3.45	3.25	3.45	3.37½
1895.....	3.12½	3.05	3.12½	3.07½	3.10	3.07½	3.12½	3.05
1896.....	3.15	3	3.20	3.07½	3.22½	3.07½	3.07½	3.02½
1897.....	3.12½	3.02½	3.37½	3.12½	3.40	3.35	3.40	3.25
1898.....	3.70	3.55	3.80	3.55	3.70	3.60	3.62½	3.55

a Gold.

b Currency.

LEAD.

243

Highest and lowest prices of lead at New York City, monthly, from 1870 to 1898, inclusive—
Continued.

[Cents per pound.]

Year.	May.		June.		July.		August.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
1870.....	6.25	6.20	6.25	6.20	6.30	6.20	6.37	6.32
1871.....	6.18	6.10	6.15	6.12	6.15	6.10	6.12	6
1872.....	6.62	6.25	6.62	6.40	6.62	6.40	6.50	6.40
1873.....	6.62	6.35	6.55	6.12	6.12	6	6.25	6
1874.....	6	5.75	6	5.62	5.80	5.62	5.80	5.65
1875.....	5.95	5.90	5.90	5.75	6	5.95	5.95	5.87
1876.....	6.50	6.10	6.50	6.25	6.35	6.20	6.37	6.25
1877.....	6	5.55	5.70	5.60	5.60	5.37	5.12	4.90
1878.....	3.50	3.25	3.50	3.12	3.62	3.25	3.50	3.20
1879.....	3.12	2.87	3.80	3.12	4.10	3.90	4.05	4
1880.....	5.25	4.40	4.75	4.50	4.75	4.25	5	4.30
1881.....	4.70	4.25	4.50	4.25	4.90	4.50	4.95	4.75
1882.....	4.85	4.60	4.90	4.55	5.15	4.90	5.10	4.95
1883.....	4.55	4.40	4.45	4.40	4.40	4.30	4.30	4.20
1884.....	3.75	3.52½	3.65	3.57½	3.70	3.55	3.70	3.52½
1885.....	3.75	3.60	3.85	3.62½	4.15	3.87½	4.25	4.12
1886.....	4.75	4.65	4.90	4.65	4.90	4.75	4.80	4.75
1887.....	4.70	4.30	5.70	4.50	4.67½	4.40	4.62½	4.55
1888.....	4.62½	4	4.10	3.65	4.07½	3.85	4.97½	4.15
1889.....	3.87½	3.60	4.05	3.90	4.05	3.80	3.95	3.75
1890.....	4.35	4	4.50	4.25	4.50	4.40	4.72½	4.35
1891.....	4.37½	4.20	4.50	4.35	4.45	4.30	4.53	4.40
1892.....	4.25	4.20	4.20	4.05	4.25	4	4.15	4
1893.....	4	3.75	3.90	3.45	3.60	3.30	3.75	3.25
1894.....	3.40	3.30	3.37½	3.25	3.65	3.37½	3.70	3.30
1895.....	3.25	3.07½	3.30	3.25	3.50	3.30	3.55	3.50
1896.....	3.05	3	3.05	3	3	2.90	2.90	2.65
1897.....	3.37½	3.22½	3.60	3.25	3.90	3.65	4.10	3.70
1898.....	3.80	3.60	3.90	3.75	4	3.80	4.10	3.90

Highest and lowest prices of lead at New York City, monthly, from 1870 to 1898, inclusive—
Continued.

[Cents per pound.]

Year.	September.		October.		November.		December.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
1870.....	6.37	6.30	6.37	6.25	6.35	6.20	6.35	6.25
1871.....	6.10	6	6	5.87	6	5.90	6	5.75
1872.....	6.50	6.30	6.62	6.40	6.60	6.50	6.60	6.42
1873.....	6.62	6.37	6.75	6.25	6.50	6	6.12	6
1874.....	6.10	5.65	6.35	6.10	6.50	6.25	6.40	6.12
1875.....	5.87	5.70	5.65	5.60	5.87	5.65	5.95	5.87
1876.....	6.25	6	6	5.80	5.80	5.70	5.70	5.65
1877.....	4.85	4.75	4.85	4.25	4.75	4.50	4.60	4.50
1878.....	3.45	3.25	3.60	3.37	3.95	3.60	4	3.90
1879.....	4	3.75	5.50	4	5.62	5	5.60	5.50
1880.....	4.90	4.80	4.87	4.65	4.85	4.75	4.75	4.25
1881.....	5.37	4.95	5.25	4.87	5.25	4.90	5.25	5
1882.....	5.15	4.95	5.15	4.85	4.90	4.50	4.75	4.50
1883.....	4.32	4.30	4.32	4.12	4.05	3.65	3.75	3.60
1884.....	3.75	3.55	3.75	3.60	3.55	3.37½	3.75	3.50
1885.....	4.25	4	4.25	4	4.60	4	4.67½	4.50
1886.....	4.70	4.45	4.30	4	4.40	4.10	4.35	4.25
1887.....	4.55	4.25	4.40	4.20	4.75	4.25	5.15	4.90
1888.....	5.12½	4.90	5.12½	3.62½	3.82½	3.60	3.82½	3.60
1889.....	4	3.85	3.90	3.75	3.90	3.75	3.90	3.75
1890.....	5	4.67½	5.25	5	5.25	4.60	4.60	4.05
1891.....	4.55	4.40	4.55	4.10	4.35	4.10	4.25	4.25
1892.....	4.15	4	3.95	3.85	3.85	3.70	3.85	3.70
1893.....	3.95	3.75	3.75	3.25	3.37½	3.30	3.30	3.20
1894.....	3.30	3.10	3.15	3.05	3.12½	3.10	3.12½	3.02½
1895.....	3.45	3.32½	3.35	3.30	3.27½	3.15	3.30	3.20
1896.....	2.80	2.72½	2.92½	2.72½	3.05	2.85	3.05	2.95
1897.....	4.35	4.25	4.25	3.85	3.85	3.75	3.75	3.65
1898.....	4.05	3.90	3.90	3.60	3.70	3.65	3.80	3.60

THE LEAD MARKET.

During 1898 the fluctuations in the lead market were within a comparatively narrow range and the price of the metal was maintained at a fairly remunerative figure, the average for New York delivery having been 3.75 cents per pound.

The market opened in January at 3.70 cents, but declined steadily during the month until 3.55 cents was reached. This brought forward buyers who took considerable quantities, the market rising until 3.80

cents was reached in the middle of February. Then a reaction set in, and values declined to 3.60 cents early in March, with a sluggish market, recovering slightly toward the end of the month.

While the English markets rose sharply in April, owing to the danger of a war between the United States and Spain, our own was slow and weak until in April consumers and speculators took hold at 3.55 cents, and lead went up to 3.75 cents, New York, early in May. In spite of purchases for armament, values showed a declining tendency, until late in the month a buying movement set in which, during June, caused an advance to 3.90 cents at the close.

Early in July the market price advanced squarely to 4 cents, New York, but realizing sales created a weakening, followed in August by heavy buying. This caused the market to rise to 4.10 cents, New York, the highest price reached during the year. A very dull period followed in September, with increasing pressure to sell in October, which carried the market down to 3.60 cents at the close of the month. A temporary buying movement early in November caused a moderate reaction, but the market relapsed to 3.60 cents early in December, until toward the end of the year, when heavy purchases caused an advance to 3.80 cents, at which the year closed.

THE WORLD'S PRODUCTION.

An effort to state correctly the lead production of the world is beset by many difficulties. In some countries there are no reliable official statistics whatever. In others the official statistics deal only with the production of lead ores or concentrates, without any reference to their metal contents. Metallurgical statistics, which after all are the only ones of commercial value, are not touched at all. Lead ores are shipped, often in large quantities, to distant countries for smelting, and base bullion travels from the country of origin to distant refineries and desilverizing works. This renders the danger of duplication very great and makes it almost impossible to assign the lead to its actual country of origin. Thus the mineral statistics of Great Britain deal only with the production of dressed lead ore. There is no attempt to present figures relating to the production of refined lead from domestic or foreign sources. The same is true of the Australian colonies.

The only comprehensive effort to deal with these difficulties is that of the Metallgesellschaft of Frankfort-on-the-Main. The figures for the United States are those arrived at by this office.

MINERAL RESOURCES.

The world's production of lead during the years 1887 to 1898.

[Metric tons.]

Country.	1887.	1888.	1889.	1890.	1891.	1892.
Germany	95,000	97,000	100,000	101,000	95,000	98,000
Spain.....	a 119,000	129,200	136,900	140,300	145,700	152,300
Great Britain...	a 50,000	a 50,000	a 47,800	49,800	49,000	44,900
Austria.....	7,800	8,000	8,000	8,300	7,600	7,300
Hungary	1,800	2,000	2,300	1,200	2,100	2,300
Italy	a 19,000	17,000	18,000	17,700	18,500	22,000
Belgium.....	10,000	11,000	9,400	9,600	12,700	10,100
France	a 5,000	6,500	5,400	4,600	6,700	8,800
Greece.....	12,500	14,500	13,500	14,200	13,300	14,400
Other European countries	a 2,000	a 2,000	a 2,000	a 2,000	a 2,000	a 2,500
United States...	132,150	137,790	141,852	130,272	161,948	157,187
Mexico	18,100	30,100	27,500	22,300	30,200	47,500
Australia b.....	a 10,000	a 19,000	a 35,000	40,500	56,000	54,000
Other countries.	a 1,000	a 1,000	a 1,000	a 1,000	a 1,000	a 1,000
Total	483,350	525,090	548,652	542,772	601,748	622,287

Country.	1893.	1894.	1895.	1896.	1897.	1898.
Germany	95,000	101,000	111,058	113,792	118,881	132,742
Spain.....	157,100	152,620	160,786	167,017	169,000	179,000
Great Britain...	38,200	42,800	55,300	57,200	40,300	a 49,000
Austria.....	7,200	7,500	8,085	10,120	9,680	a 10,000
Hungary	2,500	2,113	2,277	1,911	2,527	a 2,000
Italy	19,900	19,600	20,353	20,786	20,469	22,500
Belgium.....	12,000	13,500	15,573	15,300	14,834	14,700
France	8,100	8,758	7,627	8,232	9,916	a 10,000
Greece.....	12,800	14,000	19,800	13,200	15,600	19,600
Other European countries	a 3,000	a 4,000	a 4,000	a 4,000	a 4,500	a 4,500
United States...	147,627	147,600	154,265	170,600	192,000	201,452
Mexico	64,000	57,000	68,000	63,000	70,000	71,000
Canada.....	1,000	2,586	10,467	10,977	17,719	16,000
Australia b.....	58,000	50,000	38,000	30,000	22,000	48,000
Other countries.	a 1,000	a 1,000	.....	.....	1,200	a 1,200
Total	627,427	624,077	675,591	686,135	708,626	781,694

a Estimated. b Exclusive of that part of product not exported to Europe and America.

In these statistics the output of Great Britain includes the lead obtained from smelting foreign ores and material. The product from

English ores was 30,174 metric tons in 1893, 30,162 tons in 1894, 29,464 tons in 1895, 31,347 tons in 1896, and 26,988 metric tons in 1897.

The figures for Australia cover only that part of the lead produced which was exported to Europe or America. The Australian home consumption and the exports to Asia are ignored.

THE WORLD'S CONSUMPTION.

The Metallgesellschaft of Frankfort-on-the-Main figures the consumption of lead in the world, as follows:

World's consumption of lead, 1893 to 1898.

Country.	1893.	1894.	1895.	1896.	1897.	1898.
	<i>Metric tons.</i>	<i>Metric tons.</i>	<i>Metric tons.</i>	<i>Metric tons.</i>	<i>Metric tons.</i>	<i>Metric tons.</i>
Germany	94,571	100,678	111,652	121,980	129,898	155,372
Great Britain	178,415	161,847	170,130	196,200	182,634	211,163
France	77,085	86,160	64,657	77,773	86,735	81,589
Austria-Hungary	15,604	18,442	19,276	18,814	18,038	21,393
Italy	19,985	19,942	18,747	20,533	18,858	18,061
Switzerland	1,941	1,412	1,837	2,485	2,640	3,441
Belgium	23,088	21,858	16,221	18,723	21,421	21,200
Netherlands	a 5,000	a 5,000	a 5,000	a 5,000	a 5,000	a 5,000
Russia	24,600	27,000	22,000	21,000	25,300	25,000
Other European countries	1,500	1,700	1,600	2,800	3,200	3,800
United States	179,163	173,413	218,007	179,692	205,839	206,402
All other countries	14,700	12,300	10,600	12,100	9,400	9,900
Total	635,632	629,752	659,727	677,100	708,963	762,123

a Estimated.

These statistics seem to ignore the consumption of China, which is generally regarded as important.

ZINC.

By CHARLES KIRCHHOFF.

PRODUCTION.

The zinc industry has, generally speaking, had a good year in 1898. The consumption has been large, and prices have been above the average of recent years. To a considerable extent this has been counterbalanced, from the smelter's point of view, by the rapid rise in prices of ore, which has brought unusual activity and great prosperity to the miners of southwest Missouri and southeast Kansas. The year has witnessed an interesting struggle, becoming more and more acute, between the older smelting plants in Illinois, Missouri, and Kansas, using coal as a fuel, and the new works in the Kansas natural-gas belt, of which Iola is the productive center. The advantage of free gas in the direct lessening of cost and in the indirect economies in the metallurgical operations is causing a transfer of the industry to the favored locality.

For a series of years the production of spelter has been as follows:

Production of spelter in the United States.

Year.	Short tons.	Year.	Short tons.
1873.....	7,343	1889.....	58,860
1875.....	15,833	1890.....	63,683
1880.....	23,239	1891.....	80,873
1882.....	33,765	1892.....	87,260
1883.....	36,872	1893.....	78,832
1884.....	38,544	1894.....	75,328
1885.....	40,688	1895.....	89,686
1886.....	42,641	1896.....	81,499
1887.....	50,340	1897.....	99,960
1888.....	55,903	1898.....	115,399

In the different States the production has been as follows:

Production of spelter in the United States, by States.

Year.	Eastern and Southern States.	Illinois.	Kansas.	Missouri.	Total.
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
1882.....	5,698	18,201	7,366	2,500	33,765
1883.....	5,340	16,792	9,010	5,730	36,872
1884.....	7,861	17,594	7,859	5,230	38,544
1885.....	8,082	19,427	8,502	4,677	40,688
1886.....	6,762	21,077	8,932	5,870	42,641
1887.....	7,446	22,279	11,955	8,660	50,340
1888.....	9,561	22,445	10,432	13,465	55,903
1889.....	10,265	23,860	13,658	11,077	58,860
1890.....	9,114	26,243	15,199	13,127	63,683
1891.....	{ a 8,945 b 4,217 }	28,711	22,747	16,263	80,873
1892.....	{ a 9,582 b 4,913 }	c31,383	24,715	16,667	87,260
1893.....	{ a 8,802 b 3,882 }	c29,596	22,815	13,737	78,832
1894.....	{ a 7,400 b 1,376 }	c28,972	25,588	11,992	75,328
1895.....	{ a 9,484 b 3,697 }	c35,732	25,775	14,998	89,686
1896.....	{ a 8,139 b 2,427 }	c36,173	20,759	14,001	81,499
1897.....	{ a 7,218 b 3,365 }	c37,876	33,396	18,125	99,980
1898.....	8,631	c 47,103	40,132	19,533	115,399

a Eastern.

b Southern.

c Including Indiana.

For semiannual periods the production of spelter has been as follows:

Production of spelter, by semiannual periods.

States.	First half 1892.	Second half 1892.	First half 1893.	Second half 1893.	First half 1894.	Second half 1894.
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
Eastern	6,901	7,594	7,380	5,304	5,064	3,712
Southern						
Illinois and Indiana	15,483	15,900	16,427	16,169	13,392	15,580
Kansas	14,161	10,554	13,269	9,546	11,250	14,338
Missouri	8,954	7,713	8,718	5,019	6,458	5,534
Total	45,499	41,761	45,794	36,038	36,164	39,164

Production of spelter, by semiannual periods—Continued.

States.	First half 1896.	Second half 1896.	First half 1897.	Second half 1897.	First half 1898.	Second half 1898.
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
Eastern	4,517	3,622	3,866	3,352	2,955	3,861
Southern	1,200	1,227	1,305	2,060	1,695	
Illinois and Indiana	16,305	19,868	18,054	19,822	22,129	24,974
Kansas	11,351	9,408	15,722	17,674	21,464	18,668
Missouri	5,548	8,453	7,956	10,169	10,371	9,162
Total	38,921	42,578	46,903	53,077	58,614	56,785

During the first half of 1898 the production of the Illinois plants was 20,475 tons, rising to 21,808 tons during the second half, while the Indiana plants increased from 1,654 tons during the first six months to 3,166 tons during the last six months.

Figures bearing on the transfer of the production to the works in the gas belt are of special interest. During the first half of 1898 the total output of the works near the ore districts was 27,838 tons, of which 7,738 tons were produced by new works in the gas belt. During the second half the total output in the ore district was 23,827 tons, of which 11,533 tons are credited to the plants using gas. Thus the coal plants declined from 20,100 tons to 12,294 tons. It must be noted that the Iola plant of the Robert Lanyon's Sons Spelter Company was inactive a part of the second half of the year because injured by a fire, and that the four works building in the gas belt had not yet entered the ranks of producers. The works now running and those in course of erection possess an aggregate capacity of 40,000 short tons per annum, a capacity which will not be reached, however, until the second half of 1899.

In detail the movement in the transfer of old works to the gas belt and the establishment of new plants has been as follows:

The Robert Lanyon's Sons Spelter Company first erected in 1897 a large smelter at Iola, Kansas, and followed it with new works at La Harpe, which went into operation during the second half of that year. Messrs. W. & J. Lanyon, at Iola, added to the 600 retorts at work in January a like number in February, and increased the plant to 1,800 retorts in November. The works No. 6, at Scammon, of the Cherokee-Lanyon Spelter Company have been dismantled and have been removed to Iola. They are not yet in operation. The Prime Western Spelter Company has new works at Iola which have begun to make spelter with 600 retorts, having a capacity of from 450,000 to 500,000 pounds monthly. This capacity is to be doubled in a short time. Another new plant, just started, is that of Mr. George E. Nicholson at Iola. They have fired up 600 retorts, and 600 additional are to start about the middle of March, 1899. The Edgar Zinc Company is now building a

1,200-retort plant at Cherryvale, Kansas, which it is expected will be in operation in June, 1899. In March the Edgar Zinc Company acquired the Glendale plant of Mr. S. C. Edgar, near St. Louis, Missouri.

In Indiana the Fairmount Zinc Company began operations with 300 retorts, having a capacity of 300,000 to 400,000 pounds per month. It is the intention to double the plant in the spring of 1899.

Among the older works the following changes may be noted: The Collinsville Zinc Company, at Collinsville, Illinois, has increased its capacity 50 per cent; the North Chicago plant of the Empire Zinc Company started another furnace in October, increasing the capacity 50 per cent; the Humphrey Spelter Company has made additions which carry the monthly capacity up to 500,000 pounds; the Girard Smelting Company, at Girard, Kansas, has leased from the Cherokee-Lanyon Spelter Company the two plants of the Girard Zinc Company and the Kansas Zinc Mining and Smelting Company; the Cherokee Smelting Company has leased the No. 12 plant of the Cherokee-Lanyon Spelter Company at Cherokee, Kansas; the Columbia Zinc Company is now operating the Marion, Indiana, plants.

In February, 1899, a consolidation was effected under the name of the Lanyon Zinc Company between the Robert Lanyon's Sons Zinc Company and Messrs. W. & J. Lanyon, each owning two plants. Of these three are in the gas belt. The company also controls a large tract of natural gas and oil lands. The capital stock consists of \$1,000,000 common and \$2,000,000 8-per cent preferred stock.

ZINC MINING IN GALENA-JOPLIN DISTRICT.

PRODUCTION.

The zinc mining industry enjoyed an unusually prosperous year in 1898. The principal source of supply of zinc ore is the Galena-Joplin district of southeast Kansas and southwest Missouri. Local statistics of sales show that the quantity of zinc ore marketed was 89,300 tons in 1888, which rose to 98,440 tons in 1889, and 114,900 tons in 1890. In 1892 sales of 148,150 tons were reached. The general business depression affected the industry during the succeeding year, and it was not until 1896 that an output of 147,588 tons was attained. Then came a jump to 181,535 tons in 1897, followed by sales attaining 235,123 short tons in 1898. The figures are those compiled by the Joplin Herald, the totals of the different districts being as follows, in the order of their magnitude:

Product of lead and zinc ore in the Galena-Joplin district in 1898.

Camp.	Zinc ore.	Lead ore.	Total value.
	<i>Short tons.</i>	<i>Short tons.</i>	
Galena	73,848	7,878	\$2,247,004
Joplin	37,168	8,329	1,400,307
Cartersville	23,303	4,246	790,676
Oronogo	16,730	429	483,113

Product of lead and zinc ore in the Galena-Joplin district in 1898—Continued.

Camp.	Zinc ore.	Lead ore.	Total value.
	<i>Short tons.</i>	<i>Short tons.</i>	
Aurora	21,088	596	458,443
Duenweg	14,406	2,194	451,872
Webb City	14,412	972	404,068
Central City	9,637	583	292,060
Stotts City	6,539	200	191,326
Granby	9,666	630	176,241
Carthage	2,391	-----	64,860
Bellville	1,881	52	59,005
Hells Neck	1,919	48	57,627
Alba	1,009	7	30,281
Springfield	442	39	12,442
Sundry camps	683	270	25,937
Total	235,122	26,473	7,145,262

This shows an increase in the amount realized of about \$2,400,000 over the year 1897, in spite of the fact that the lead-ore product fell off about 3,650 short tons.

PRICES.

The advance in the price of zinc ore during 1898 was extraordinary; while in 1897 the price fluctuated between \$21.50 and \$24.50, it rose as high as \$40.50 in December, 1898. The Joplin Herald reports the average monthly prices of zinc ore to have been as follows:

Average prices of zinc ore in the Galena-Joplin district in 1898.

Month.	Price per ton.	Month.	Price per ton.
January	\$23.00	July	\$28.00
February	22.50	August	28.37
March	23.00	September	31.00
April	24.62	October	33.70
May	26.50	November	36.25
June	28.50	December	37.00

During the closing weeks of the year a sharp decline took place in the price of zinc ore which led to the formation of the Missouri and Kansas Zinc Miners' Association, in which every camp is represented. It is proposed to regulate the supply of ore, one of the plans being to combine the concentrating plants of the entire district into groups of 20, shutting down a group at a time in alphabetical order when a surplus of ore is threatened.

CONSUMPTION.

Consumption in the United States has developed greatly. The following estimate may be presented, coupled with the statement, however, that the reports of stocks from the producers are only partial, and are probably usually larger than the figures accepted.

Estimated consumption of spelter, 1895, 1896, 1897, and 1898.

	1895.	1896.	1897.	1898.
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
Production.....	89,686	81,499	99,980	115,399
Imports.....	432	428	1,279	1,371
Stocks at beginning of year.....	4,911	5,802	7,477	5,709
Total supply.....	95,029	87,729	108,736	122,479
Deduct—				
Exports of foreign.....		4		18
Exports of domestic.....	1,530	10,130	14,245	10,499
Stock at end of year.....	5,802	7,477	5,709	3,695
Total.....	7,332	17,611	19,954	14,212
Apparent home consumption.....	87,697	70,118	88,782	108,267

The consumption, therefore, has been greater than it has ever been in this country. It is understood that the requirements of the galvanizing industry, notably that of the wire branch, have been phenomenal, and that the requirements of the brass manufacturers have been heavy, as is also evidenced by the consumption of copper.

IMPORTS AND EXPORTS.

Zinc imported and entered for consumption in the United States, 1867 to 1898.

Year ending—	Blocks or pigs.		Sheets.	
	Quantity.	Value.	Quantity.	Value.
June 30—	<i>Pounds.</i>		<i>Pounds.</i>	
1867.....	5,752,611	\$256,366	5,142,417	\$311,767
1868.....	9,327,968	417,273	3,557,448	203,883
1869.....	13,211,575	590,332	8,306,723	478,646
1870.....	9,221,121	415,497	9,542,687	509,860
1871.....	11,159,040	508,355	7,646,821	409,243
1872.....	11,802,247	522,524	10,704,944	593,885
1873.....	6,839,897	331,399	11,122,143	715,706
1874.....	3,593,570	203,479	6,016,835	424,504

Zinc imported and entered for consumption in the United States, 1867 to 1898—Cont'd.

Year ending—	Blocks or pigs.		Sheets.	
	Quantity.	Value.	Quantity.	Value.
June 30—	<i>Pounds.</i>		<i>Pounds.</i>	
1875.....	2,034,252	\$101,766	7,320,713	\$444,539
1876.....	947,322	56,082	4,611,360	298,308
1877.....	1,266,894	63,250	1,341,333	81,815
1878.....	1,270,184	57,753	1,255,620	69,381
1879.....	1,419,791	53,294	1,111,225	53,050
1880.....	8,092,620	371,920	4,069,310	210,230
1881.....	2,859,216	125,457	2,727,324	129,158
1882.....	18,408,391	736,964	4,413,042	207,032
1883.....	17,067,211	655,503	3,909,239	141,823
1884.....	5,869,738	208,852	952,253	36,120
1885.....	3,515,840	113,268	1,839,860	64,781
December 31—				
1886.....	4,300,830	136,138	1,092,400	40,320
1887.....	8,387,647	276,122	926,150	32,526
1888.....	3,825,947	146,156	295,287	12,558
1889.....	2,052,559	77,845	1,014,873	43,356
1890.....	1,997,524	101,335	781,366	43,495
1891.....	808,094	41,199	21,948	1,460
1892.....	297,969	16,520	27,272	2,216
1893.....	425,183	22,790	28,913	1,985
1894.....	387,788	13,788	39,947	2,061
1895.....	744,301	26,782	42,513	2,773
1896.....	1,040,719	32,096	27,321	1,358
1897.....	2,905,451	109,520	15,971	786
1898.....	2,741,361	109,626	(a)	(a)

Year ending—	Old.		Value of man- ufactures.	Total value.
	Quantity.	Value.		
June 30—	<i>Pounds.</i>			
1867.....			\$1,835	\$569,968
1868.....			1,623	622,779
1869.....			2,083	1,071,061
1870.....			21,696	947,053
1871.....			26,366	943,964
1872.....			58,668	1,175,077
1873.....			56,813	1,103,918
1874.....			48,304	676,287
1875.....			26,330	572,635

a Figures of imports for calendar year not available at the time of going to press.

MINERAL RESOURCES.

Zinc imported and entered for consumption in the United States, 1867 to 1898—Cont'd.

Year ending—	Old.		Value of man- ufactures.	Total value.
	Quantity.	Value.		
June 30—	Pounds.			
1876.....			\$18,427	\$372,817
1877.....			2,496	147,561
1878.....			4,892	132,026
1879.....			3,374	109,718
1880.....			3,571	585,721
1881.....			7,603	262,218
1882.....			4,940	948,936
1883.....			5,606	802,932
1884.....			4,795	249,767
1885.....			2,054	180,103
December 31—				
1886.....			9,162	185,620
1887.....			11,329	319,977
1888.....			12,080	170,794
1889.....			19,580	140,781
1890.....			9,740	154,570
1891.....				42,659
1892.....	115,203	\$6,556	20,677	45,969
1893.....	265	21	16,479	41,275
1894.....	27,754	530	11,816	28,195
1895.....	64,398	899	9,953	40,407
1896.....	14,855	267	9,800	43,521
1897.....	41,643	886	11,459	122,651
1898.....	(a)	(a)	(a)	(a)

Imports of zinc oxide from 1885 to 1898.

Year ending—	Dry.	In oil.	Year ending—	Dry.	In oil.
	Pounds.	Pounds.	December 31—	Pounds.	Pounds.
June 30, 1885.	2,233,128	98,566	1891.....	2,839,351	128,140
December 31—			1892.....	2,442,014	111,190
1886.....	3,526,289	79,788	1893.....	3,900,749	254,807
1887.....	4,961,080	123,216	1894.....	3,371,292	59,291
1888.....	1,401,342	51,985	1895.....	4,546,049	129,343
1889.....	2,686,861	66,240	1896.....	4,572,781	311,023
1890.....	2,631,458	102,298	1897.....	5,564,763	502,357
			1898.....	(a)	(a)

a Figures of imports for calendar year not available at the time of going to press.

Exports of zinc and zinc ore of domestic production, 1864 to 1898.

Year ending—	Ore or oxide.		Plates, sheets, pigs, or bars.		Value of manufactures.	Total value.
	Quantity.	Value.	Quantity.	Value.		
June 30—	<i>Cwt.</i>		<i>Pounds.</i>			
1864.....	14,810	\$116,431	95,738	\$12,269		\$128,700
1865.....	99,371	114,149	184,183	22,740		136,889
1866.....	4,485	25,091	140,798	13,290		38,381
1867.....	3,676	32,041	312,227	30,587		62,628
1868.....	8,344	74,706	1,022,699	68,214		142,920
1869.....		65,411				65,411
1870.....	15,286	81,487	110,157	10,672		92,159
1871.....	9,621	48,292	76,380	7,823		56,115
1872.....	3,686	20,880	62,919	5,726		26,606
1873.....	234	2,304	73,953	4,656		6,960
1874.....	2,550	20,037	43,566	3,612		23,649
1875.....	3,083	20,659	38,090	4,245	\$1,000	25,904
1876.....	10,178	66,259	134,542	11,651	4,333	82,243
1877.....	6,428	34,468	1,419,922	115,122	1,118	150,708
1878.....	16,050	83,831	2,545,320	216,580	567	300,978
1879.....	10,660	40,399	2,132,949	170,654		211,053
1880.....	13,024	42,036	1,368,302	119,264		161,300
1881.....	11,390	16,405	1,491,786	132,805	168	149,378
1882.....	10,904	13,736	1,489,552	124,638		138,374
1883.....	3,045	11,509	852,333	70,981	734	83,224
1884.....	4,780	16,685	126,043	9,576	4,666	30,927
1885.....	6,840	22,824	101,685	7,270	4,991	35,085
December 31—						
1886.....	26,620	49,455	917,229	75,192	13,526	138,173
1887.....	4,700	17,286	136,670	9,017	16,789	43,092
1888.....	4,560	18,034	62,234	4,270	19,098	41,402
1889.....	26,760	73,802	879,785	44,049	35,732	153,583
1890.....	77,360	195,113	3,295,584	126,291	23,587	344,991
1891.....	115,820	149,435	4,294,656	278,182	38,921	466,538
1892.....	18,380	41,186	12,494,335	669,549	166,794	877,529
1893.....	980	1,271	7,446,934	413,673	224,787	639,731
1894.....		5	3,607,050	144,074	99,406	243,485
1895.....	480	1,008	3,060,805	153,175	50,051	204,234
1896.....	41,500	47,408	20,260,169	1,013,620	51,001	1,112,029
1897.....	165,200	211,350	28,490,662	1,356,538	71,021	1,638,909
1898.....	210,400	299,870	20,998,413	1,033,959	141,932	1,475,761

The following table shows the export of zinc ore and of spelter during the calendar year 1898, grouped first by customs districts and secondly by countries of destination:

Domestic exports of zinc for calendar year 1898.

	Zinc.			
	Ore.		Figs. bars, plates, and sheets.	
	Quantity.	Value.	Quantity.	Value.
<i>Customs districts.</i>	<i>Long tons.</i>		<i>Pounds.</i>	
New York, New York.....	6,879	\$191,728	729,751	\$29,962
Philadelphia, Pennsylvania...	3,313	96,485	98,740	4,935
Galveston, Texas			8,821,704	438,295
Mobile, Alabama			112	9
New Orleans, Louisiana.....	328	11,657	10,935,349	540,742
Pearl River, Mississippi.....			500	55
Arizona			8,889	374
Detroit, Michigan			382,480	18,305
Huron, Michigan			15,989	958
Memphremagog, Vermont.....			70	6
North and South Dakota.....			4,022	274
Vermont, Vermont.....			807	44
Total	10,520	299,870	20,998,413	1,033,959
<i>Countries.</i>				
Belgium.....			223,545	11,177
France			112,052	5,603
Netherlands	10,376	294,905	1,258,985	58,637
United Kingdom	140	4,857	18,932,042	934,901
Quebec, Ontario, etc			403,308	19,397
Central American States:				
Costa Rica			693	40
Honduras			6,929	504
Nicaragua			1,924	104
Mexico.....	4	108	26,889	1,582
West Indies:				
Dutch			5,845	296
Haiti			10,061	763
Colombia			13,039	756
Ecuador			643	44
Venezuela.....			600	28
Hawaiian Islands			1,858	127
Total	10,520	299,870	20,998,413	1,033,959

PRICES.

The spelter market opened in the year 1898 with a moderate activity, the St. Louis prices fluctuating between 3.75 cents and 3.80 cents per pound, while New York quoted 3.90 to 4 cents. In February, however, greater activity developed; the market gained in strength and rose to 4.05 cents at St. Louis and 4.25 cents at New York toward the end of March. Then, however, prices eased, and early in May the metal had become weak and dull, the price receding to 3.90 cents at St. Louis and 4.10 cents at New York. The flooding of the mines and the advance in the price of ores caused a reaction which developed into a sudden jump to 5 cents at St. Louis on the announcement that a large plant at Iola, Kansas, had been destroyed by fire. An active speculative movement in spot spelter was accompanied by reports of an effort to reduce the output. Futures, however, were selling at a considerable discount on spot values. This pressure brought about a declining tendency, which led to sales as low as 4.25 cents at St. Louis and 4.45 cents at New York. Even the European markets, which had steadily appreciated during the whole year, reflected the reaction. In London spelter had advanced from £17 12s. 6d. early in January to £20 7s. 6d. in the middle of July. In August came greater activity, putting pressure on the ore market, which again was quickly reflected in rising quotations for the metal. A steady and rapid advance during September, October, and November carried the price from 4.25 cents at St. Louis early in August to 5.20 cents in November. The market then showed some irregularity at first and weakening rapidly caused a decline to 4.70 cents at St. Louis at the close of the year. London, which had fallen to £20 late in July, rose to £24 15s. in October, but closed the year at £23 10s.

The fluctuations in prices during the year in the primary market, St. Louis, in New York, and in London, are shown in the following table:

Fluctuations in prices of spelter in 1898.

Months.	Saint Louis (per pound).		New York (per pound).		London (per long ton).					
	Cents.		Cents.		£	s.	d.	£	s.	d.
January	3.75	to 3.80	3.90	to 4	17	12	6	to 17	18	10
February	3.80	3.95	3.90	4.10	17	17	6	18	2	6
March	4	4.05	4.15	4.25	18	5	0	18	10	0
April	3.95	4.05	4.15	4.30	18	12	6	18	18	9
May	3.90	4.10	4.10	4.30	19	2	6	19	5	0
June	4.12½	5	4.30	5.15	19	8	9	20	1	3
July	4.30	4.60	4.45	4.80	20	0	0	20	7	6
August	4.25	4.55	4.45	4.75	20	0	0	20	17	6
September....	4.60	4.65	4.70	4.82½	21	2	6	22	0	0
October	4.62½	5	4.82½	5.15	22	5	0	24	15	0
November	5.05	5.20	5.15	5.25	24	0	0	24	15	0
December	4.70	5.25	4.90	5.30	23	10	0	24	0	0

The following table summarizes the prices of spelter since 1875:

Price of common Western spelter in New York City, 1875 to 1898.

[Cents per pound; figures in parentheses are combination prices.]

Year.	January.		February.		March.		April.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
1875.....	6.75	6.37	6.67	6.25	6.50	6.20	(7)	6.50
1876.....	(7.60)	7.40	(7.75)	7.50	(7.75)	7.62	(8)	7.60
1877.....	6.50	6.25	6.62	6.50	6.50	6.37	6.37	6.25
1878.....	5.75	5.50	5.62	5.25	5.62	5.25	5.25	5
1879.....	4.50	4.25	4.62	4.40	4.62	4.37	4.75	4.25
1880.....	6.50	5.87	6.75	6.37	6.75	6.50	6.50	6.12
1881.....	5.25	4.87	5.25	5.12	5	4.87	5.12	4.75
1882.....	6	5.75	5.75	5.62	5.62	5.37	5.50	5.25
1883.....	4.62	4.50	4.62	4.50	4.75	4.62	4.75	4.60
1884.....	4.37	4.20	4.40	4.25	4.60	4.40	4.65	4.50
1885.....	4.50	4.12	4.30	4.25	4.30	4.12	4.30	4.12
1886.....	4.50	4.30	4.55	4.30	4.60	4.50	4.60	4.50
1887.....	4.60	4.50	4.60	4.40	4.60	4.40	4.65	4.45
1888.....	5.37	5.20	5.35	5.25	5.25	4.87	4.87	4.60
1889.....	5	5	5	4.90	4.87	4.70	4.65	4.65
1890.....	5.45	5.35	5.35	4.20	5.20	5	5	4.90
1891.....	6	5.25	5.25	5	5.10	5	5.10	4.90
1892.....	4.70	4.60	4.60	4.55	4.60	4.50	4.80	4.60
1893.....	4.35	4.30	4.30	4.25	4.25	4.20	4.50	4.30
1894.....	3.60	3.50	4	3.60	3.85	3.80	3.75	3.50
1895.....	3.35	3.20	3.20	3.10	3.20	3.15	3.30	3.25
1896.....	4.05	4	4.15	4	4.15	4.10	4.20	4.05
1897.....	4.10	3.90	4.10	4	4.15	4.10	4.15	4.10
1898.....	4	3.90	4.10	3.90	4.25	4.15	4.30	4.15

ZINC.

261

Price of common Western spelter in New York City, 1875 to 1898—Continued.

Year	May.		June.		July.		August.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
1875.....	(7.25)	7.15	(7.25)	7.15	(7.35)	7.25	(7.25)	7.10
1876.....	(8)	7.75	(8)	7.25	7.25	7.12	7.25	7
1877.....	6.25	6	6.12	5.87	5.87	5.62	5.90	5.80
1878.....	5	4.62	4.62	4.25	4.75	4.50	4.87	4.50
1879.....	4.50	4.25	4.37	4.12	4.75	4.37	5.62	4.80
1880.....	6	4.62	5.50	5.12	5	4.87	5.25	4.87
1881.....	5	4.87	5	4.75	5	4.75	5.12	5
1882.....	5.62	5.25	5.37	5.25	5.37	5.12	5.50	5.12
1883.....	4.75	4.50	4.62	4.37	4.50	4.30	4.40	4.30
1884.....	4.60	4.45	4.60	4.45	4.55	4.45	4.62	4.52
1885.....	4.25	4.10	4.10	4	4.40	4.10	4.60	4.40
1886.....	4.60	4.40	4.40	4.35	4.40	4.30	4.40	4.30
1887.....	4.65	4.45	4.65	4.50	4.50	4.50	4.60	4.55
1888.....	4.65	4.60	4.60	4.50	4.55	4.50	4.87	4.50
1889.....	4.85	4.62	5	5	5.10	5	5.20	5.15
1890.....	5.45	5	5.60	5.35	5.60	5.40	5.55	5.40
1891.....	4.90	4.85	5.10	4.90	5.10	5.05	5.10	5
1892.....	4.90	4.80	4.90	4.80	4.85	4.70	4.70	4.65
1893.....	4.40	4.20	4.25	4.15	4.15	3.90	3.90	3.55
1894.....	3.55	3.45	3.50	3.40	3.50	3.45	3.45	3.40
1895.....	3.65	3.30	3.75	3.30	3.85	3.70	4.20	4
1896.....	4.15	4	4.15	4	4.10	3.90	3.90	3.65
1897.....	4.20	4.10	4.25	4.15	4.30	4.20	4.35	4.25
1898.....	4.30	4.10	5.15	4.30	4.80	4.45	4.75	4.45

Price of common Western spelter in New York City, 1875 to 1898—Continued.

Year.	September.		October.		November.		December.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
1875.....	(7.25)	7.10	(7.40)	7.15	(7.40)	7.15	(7.40)	7.15
1876.....	7.12	6.80	6.75	6.62	6.62	6.37	6.50	6.37
1877.....	5.87	5.75	5.90	5.70	5.87	5.62	5.75	5.50
1878.....	4.87	4.75	4.82	4.50	4.75	4.50	4.37	4.25
1879.....	6	5.62	6.37	6	6.25	5.87	6.25	6
1880.....	5.12	4.75	5	4.87	4.90	4.65	4.75	4.65
1881.....	5.25	5	5.37	5.25	5.87	5.50	6	5.87
1882.....	5.37	5.12	5.37	5.12	5.12	4.87	4.87	4.50
1883.....	4.50	4.40	4.45	4.35	4.40	4.37	4.37	4.35
1884.....	4.62	4.50	4.55	4.40	4.40	4.30	4.25	4
1885.....	4.62	4.50	4.62	4.50	4.60	4.45	4.60	4.45
1886.....	4.40	4.25	4.30	4.25	4.30	4.25	4.50	4.35
1887.....	4.65	4.60	4.65	4.50	4.80	4.52	5.87	5
1888.....	5.12	4.75	5.12	4.87	5.12	4.87	5.12	4.87
1889.....	5.15	5.10	5.15	5.10	5.25	5.05	5.35	5.30
1890.....	5.65	5.50	6	5.65	6.10	5.90	6	5.90
1891.....	5	4.85	5.15	4.95	4.90	4.75	4.75	4.65
1892.....	4.65	4.50	4.50	4.35	4.40	4.35	4.40	4.35
1893.....	3.75	3.65	3.70	3.55	3.85	3.60	3.80	3.70
1894.....	3.50	3.40	3.50	3.37	3.40	3.35	3.35	3.25
1895.....	4.35	4.15	4.20	3.90	3.80	3.45	3.50	3.40
1896.....	3.70	3.60	3.75	3.65	4.25	3.75	4.25	4.15
1897.....	4.35	4.25	4.30	4.15	4.25	3.90	3.90	3.75
1898.....	4.82½	4.70	5.15	4.82½	5.25	5.15	5.30	4.90

FOREIGN SPELTER PRODUCTION.

Messrs. Henry R. Merton & Co., of London, make the following report on the spelter production of Europe:

Estimate of the production of zinc in Europe.

[Long tons.]

Country.	1896.	1897.	1898.	1899.	1900.	1893.	1892.
Rhine district and Belgium	188,815	184,455	179,780	172,135	152,420	149,750	143,305
Silesia	97,670	94,045	95,875	93,620	91,145	90,310	87,760
Great Britain	27,190	23,430	25,880	29,495	32,065	28,375	30,310
France and Spain	32,135	32,120	28,450	22,895	21,245	20,585	18,662
Austria	7,115	8,185	9,255	8,355	8,580	7,580	5,020
Poland	5,575	5,760	6,165	4,960	5,015	4,530	4,270
Total	358,500	347,995	345,355	331,400	310,470	301,110	289,327

Country.	1891.	1890.	1889.	1888.	1887.	1886.	1885.
Rhine district and Belgium	139,695	137,630	134,648	133,245	130,995	129,020	129,754
Silesia	87,080	87,475	85,653	83,375	81,375	81,630	79,623
Great Britain	29,410	29,145	30,806	26,783	19,839	21,230	24,299
France and Spain	18,360	18,240	16,785	16,140	16,028	15,305	14,847
Austria	6,440	7,135	6,830	4,977	5,338	5,000	5,610
Poland	3,760	3,620	3,026	3,785	3,580	4,145	5,019
Total	284,745	283,245	277,248	268,305	257,155	258,330	259,152

The output of the works in the different districts was as follows:

Production of zinc by principal foreign producers from 1894 to 1898.

[Long tons.]

Country.	1896.	1897.	1898.	1899.	1900.
Rhine district and Belgium:					
Vieille Montagne	68,325	67,600	67,500	63,545	54,030
Stolberg Co	18,260	17,650	16,715	16,385	15,170
Austro-Belge	10,045	9,630	9,810	9,855	9,595
G. Dumont & Frères	11,965	11,360	10,040	10,080	9,415
Rhein-Nassau Co	9,725	9,495	8,870	9,085	8,165
L. de Laminne	6,895	7,260	7,050	6,440	6,930
Escombrera Bleyberg	5,275	5,075	5,575	5,690	5,750
Grillo	6,080	6,155	6,320	6,195	5,615
Märk, Westf., Bergw.,					
Verein	5,825	5,825	6,220	6,155	5,620
Nouvelle Montagne	10,470	8,255	7,695	6,815	5,290
Berzelius	5,065	5,055	5,010	5,535	5,350

Production of zinc by principal foreign producers—Continued.

Country.	1898.	1897.	1896.	1895.	1894.
Rhine district and Belgium—					
Continued.					
Biache St. Vast (Esch- ger Ghesquire & Co.).	3,560	3,450	3,810	4,205	4,375
Société Prayon	8,670	8,840	^a 8,000	7,330	4,110
Société de Boom	7,340	7,855	8,380	7,155	7,065
Zinkmaatschappij in Lim- burg					^a 700
Société Campine	6,700	6,600	4,770	4,200	^a 2,810
Cie d'Overpelt (Schulte & Co.	4,615	4,350	3,965	3,465	2,430
Total	188,815	184,455	179,730	172,135	152,420
Silesia:					
Schlesische Actien-Ge- sellschaft	26,950	26,270	26,430	25,950	25,230
G. von Glesche's Erben..	22,995	20,185	20,355	19,860	19,385
Hohenlohe (Herzog von Ujest)	23,250	24,460	25,995	21,140	17,265
Graf H. Henckel von Donnersmarck	13,540	12,185	11,980	11,680	12,005
Graefin Schaffgotsch				3,570	6,940
Graf G. Henckel von Donnersmarck	3,880	4,025	4,320	4,400	4,185
H. Roth	3,845	3,550	3,250	3,320	1,805
Wünsch	1,830	1,925	2,065	2,155	1,980
Vereinigte Königs & Laurahütte	1,190	1,260	1,340	1,400	1,270
Baron v. Horschitz'sche Erben					935
Fiscus	190	185	140	145	145
Total	97,670	94,025	95,875	93,620	91,145
Great Britain:					
Vivian & Sons	4,720	5,050	5,120	6,970	8,005
English Crown Spelter Co., Limited	5,395	5,435	5,360	5,700	5,515
Dillwyn & Co.	5,100	4,040	4,265	4,935	4,870
Swansea Vale Spelter Co.	1,705	1,305	1,665	2,375	2,380
Villiers Spelter Co.	^a 1,200	^a 1,180	1,670	2,155	2,300
Pascoe, Grenfell & Sons.	1,600	1,190	1,320	1,680	1,455
Nenthead & Tynedale Co			640	1,775	1,870
John Lysaght, Limited.	3,360	3,540	2,790	1,805	2,915

^a Estimated.

Production of zinc by principal foreign producers—Continued.

Country.	1898.	1897.	1896.	1895.	1894.
Great Britain—Continued					
H. Kenyon & Co.	510	490	550	500	505
Leeswood Co.	3,600	1,200	1,500	1,600	1,750
Sundries					500
Total	27,190	23,430	24,880	29,495	32,065
France and Spain:					
Asturienne	23,710	23,385	20,710	17,915	18,695
St. Amand	2,500	2,580	2,585	2,520	2,550
Malfidano	4,910	4,789	5,155	2,460	
Côted'Or	1,015	1,375			
Total	32,135	32,120	28,450	22,895	21,245
Austria:					
Sagór	785	955	1,310	1,080	1,225
Cilli	2,485	2,505	2,310	1,990	2,580
Sierza-Niedzieliska	2,845	4,525	4,650	4,300	4,420
Merklin			985	985	355
Trzevinia	1,000	200			
Total	7,115	8,185	9,255	8,355	8,580
Poland	5,575	5,760	6,155	4,960	5,015

The largest producer of spelter in the world is the Vieille-Montagne Company, having made, in 1898, 69,351 metric tons of crude zinc, or one-fifth of the whole output of Europe. The company rolled 68,745 tons of sheet zinc and made 8,894 tons of zinc white. The improvement in the position of the industry in Europe is proved by the fact that the average price of spelter rose from 434.85 francs in 1897 to 507.80 francs in 1898. The company owns and operates mines in Sweden, at Bensberg, at Moresnet, and also at Nenthead in Cumberland. During 1898 a new concentrating plant was completed at Bensberg. At Moresnet the calamine is approaching exhaustion, but large bodies of blende have been developed, and a great new concentrating plant is to be built. At Nenthead work is progressing to carry the output of the mines from 4,500 tons to 20,000 tons annually. The Baelen-Wenzel roasting plant will be quintupled before the end of 1899, and will have a capacity for desulphurizing 75,000 tons of blende. A sulphuric acid plant is being added.

The gross profit for 1898 was 6,953,074 francs, from which must be deducted 736,852 francs for general expenses, discounts, interest, etc., leaving 6,216,221 francs net. After applying 438,666 francs to writing off on mines and works and placing 1,065,511 francs to reserve account,

532,755 francs went to the administration, 133,189 francs to the directors, and 4,050,000 francs for interest on capital and for dividends, the capital being 9,000,000 francs.

The Nouvelle Montagne Company, of Engis, Belgium, is a more recent concern, which, in 1898, produced 10,592 metric tons of spelter. During 1898 the net profit was 1,414,677 francs, as compared with 636,597 francs in 1897. On various properties and equipments 416,043 francs were written off; there was paid to stockholders 20 per cent, or 600,000 francs, in dividends; and 112,444 francs to the management, directors, and employees, while 286,190 francs went to the reserve. The company has a capital of 3,000,000 francs.

ALUMINUM AND BAUXITE.

ALUMINUM.

PRODUCTION.

The production of aluminum in 1898 amounted to 5,200,000 pounds, an increase of 30 per cent over the amount produced in 1897 and of 300 per cent over 1896. As shown in the following table, the production has increased each year since the beginning of the industry in 1883. In the sixteen years of its existence as an industry in this country the production has grown from 83 pounds at the beginning to over 5,000,000 pounds in 1898. The combined product of 1897 and 1898 was equivalent to more than 2.6 times that of the fourteen preceding years.

The value of the product in 1898 was \$1,716,000, an increase of \$216,000 over that of 1897, although the average value per pound showed a decline from 37½ cents to 33 cents, in accordance with the policy of the producers to encourage the use of the metal by cheapening the cost to the consumer whenever possible. The price represents, of course, the metal in the first stage of its manufacture, the price for sheets, wire, and other manufactures bearing the usual approximate additional cost.

Production of aluminum in the United States from 1883 to 1898.

Year.	Quantity.	Year.	Quantity.
	<i>Pounds.</i>		<i>Pounds.</i>
1883.....	83	1892.....	259,885
1884.....	150	1893.....	333,629
1885.....	283	1894.....	550,000
1886.....	3,000	1895.....	920,000
1887.....	18,000	1896.....	1,300,000
1888.....	19,000	1897.....	4,000,000
1889.....	47,468	1898.....	5,200,000
1890.....	61,281	Total	12,862,779
1891.....	150,000		

IMPORTS.

Aluminum imported and entered for consumption in the United States from 1870 to 1890.

Year ending—	Quantity.	Value.	Year ending—	Quantity.	Value.
June 30—	<i>Pounds.</i>		June 30—	<i>Pounds.</i>	
1870 .....	.....	\$98	1881	517. 10	\$6, 071
1871 .....	.....	341	1882	556. 50	6, 450
1872 .....	.....	.....	1883	426. 25	5, 070
1873	2	2	1884	595	8, 416
1874	683	2, 125	1885	439	4, 736
1875	434	1, 355	Dec. 31—		
1876	139	1, 412	1886	452. 10	5, 369
1877	131	1, 551	1887	1, 260	12, 119
1878	251	2, 978	1888	1, 348. 53	14, 086
1879	284. 44	3, 423	1889	998	4, 840
1880	340. 75	4, 042	1890	2, 051	7, 062

Imports of crude and manufactured aluminum from 1891 to 1898.

Calendar year.	Crude.		Leaf.		Plates, sheets, bars, and rods.		Manufac- tures.	Total value.
	Quantity.	Value.	Packs of 100.	Value.	Quantity.	Value.		
	<i>Pounds.</i>				<i>Pounds.</i>			
1891.....	3, 922	\$6, 266	10, 033	\$1, 135	.....	.....	\$1, 161	\$8, 562
1892.....	43	51	11, 540	1, 202	.....	.....	1, 036	2, 289
1893.....	7, 816	4, 683	18, 700	1, 903	.....	.....	1, 679	8, 265
1894.....	5, 306	2, 514	10, 780	1, 210	.....	.....	386	4, 110
1895.....	25, 294	7, 814	6, 610	646	.....	.....	1, 841	10, 301
1896.....	698	591	4, 657	523	.....	.....	2, 365	3, 479
1897.....	1, 822	1, 082	4, 260	368	4, 424	\$3, 058	221	4, 729
1898.....	60	30	2, 000	174	18, 442	8, 991	.....	4, 675

BAUXITE.

PRODUCTION.

The production in 1898 amounted to 25,149 long tons, valued at \$75,437, as compared with 20,590 long tons, worth \$57,652, in 1897, an increase of 4,559 tons, or 22 per cent, in quantity and of \$17,785, or 31 per cent, in value. The output has increased each year since 1893. Georgia and Alabama continue the only sources of supply.

Production of bauxite in the United States from 1889 to 1898, by States.

Calendar year.	Georgia.	Alabama.	Total.	Value.
	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	
1889.....	728		728	\$2,366
1890.....	1,844		1,844	6,012
1891.....	3,301	292	3,593	11,675
1892.....	5,110	5,408	10,518	34,183
1893.....	2,415	6,764	9,179	29,507
1894.....	2,060	9,016	11,066	35,818
1895.....	3,756	13,313	17,069	44,000
1896.....	7,313	11,051	18,364	47,338
1897.....	7,507	13,083	20,590	57,652
1898.....			25,149	75,437

QUICKSILVER.

PRODUCTION.

California continues to furnish the entire domestic supply. The production from the well-known sources in this State amounted in 1898 to 31,092 flasks, the largest output, with one exception, in the last ten years, and a notable recovery from the declining tendency in 1896 and 1897.

In the following table is presented the statistics of production since the mining of quicksilver began in 1850. It shows that the grand total of production in forty-nine years has amounted to 1,801,568 flasks, an average of 38,800 flasks per year. It also shows that the years of bonanza production were from 1875 to 1882, when the average annual output was over 64,000 flasks, about 40 per cent more than the general average, and about double the average production in the last fifteen years. In the column headed "Various mines" are included in 1897 and 1898 Central, Chicago, Corona, Manhattan, and Sunderland mines. The Mount Jackson mine was worked under the management of the Great Eastern, and its product is found in that column.

Total product of quicksilver in the United States.

[Flasks of 76½ pounds, net.]

Year.	New Almaden.	New Idria.	Redington.	Sulphur Bank.	Great Western.	Napa Consolidated.
1850.....	7,723					
1851.....	27,779					
1852.....	15,901					
1853.....	22,284					
1854.....	30,004					
1855.....	29,142					
1856.....	27,138					
1857.....	28,204					
1858.....	26,761					
1859.....	1,294					
1860.....	7,061					
1861.....	34,429					
1862.....	39,671		444			
1863.....	32,803		852			
1864.....	42,489		1,914			
1865.....	47,194	(a)	3,545			
1866.....	35,150	6,525	3,254			

^a Production from 1868 to 1866 was 17,455 flasks; no yearly details obtainable; they are in the product of "Various mines."

Total product of quicksilver in the United States—Continued.

Year.	New Almaden.	New Idria.	Redington.	Sulphur Bank.	Great Western.	Napa Con- solidated.
1867.....	24,461	11,493	7,862			
1868.....	25,628	12,180	8,686			
1869.....	16,898	10,315	5,018			
1870.....	14,423	9,888	4,546			
1871.....	18,568	8,180	2,128			
1872.....	18,574	8,171	3,046			
1873.....	11,042	7,735	3,294		340	
1874.....	9,084	6,911	6,678	573	1,122	
1875.....	13,648	8,432	7,513	5,372	3,384	
1876.....	20,549	7,272	9,183	8,367	4,322	573
1877.....	23,996	6,316	9,399	10,993	5,856	2,229
1878.....	15,852	5,138	6,686	9,465	4,963	3,049
1879.....	20,514	4,425	4,516	9,249	6,333	3,605
1880.....	23,465	3,209	2,139	10,706	6,442	4,416
1881.....	26,060	2,775	2,194	11,152	6,241	5,552
1882.....	28,070	1,953	2,171	5,014	5,179	6,842
1883.....	29,000	1,606	1,894	2,612	3,869	5,890
1884.....	20,000	1,025	881	890	3,292	4,307
1885.....	21,400	1,144	385	1,296	3,469	3,506
1886.....	18,000	1,406	409	1,449	1,949	5,247
1887.....	20,000	1,890	673	1,490	1,446	5,574
1888.....	18,000	1,320	126	2,164	625	5,024
1889.....	13,100	980	812	2,283	556	4,590
1890.....	12,000	977	505	1,608	1,334	3,429
1891.....	8,200	792	442	1,375	1,844	4,454
1892.....	5,563	848	728	1,393	5,867	5,680
1893.....	6,614	869	1,012	1,200	3,187	6,120
1894.....	7,235	1,005	1,200	348	5,341	4,930
1895.....	7,050	1,100	163	2,703	5,023	5,400
1896.....	6,200	1,335	1,906	1,236	2,303	5,000
1897.....	4,700	3,605	1,550		2,709	6,200
1898.....	5,875	5,000	1,012		1,150	6,850
Total ..	967,796	145,820	107,766	92,938	88,146	108,467

Year.	Great Eastern.	Mirabel.	Ætna.	Altoona.	Abbott.	Various mines.	Total yearly production of California mines.
1850.....							7,723
1851.....							27,779
1852.....						4,099	20,000
1853.....							22,284
1854.....							30,004
1855.....						3,858	33,000
1856.....						2,862	30,000
1857.....							28,204
1858.....						5,239	31,000
1859.....						11,706	13,000
1860.....						2,939	10,000
1861.....						571	35,000
1862.....						1,885	42,000
1863.....						6,876	40,531
1864.....						3,086	47,489
1865.....						2,261	53,000
1866.....						2,621	46,550

QUICKSILVER.

273

Total product of quicksilver in the United States—Continued.

Year.	Great Eastern.	Mirabel.	Ætna.	Altoona.	Abbott.	Various mines.	Total yearly production of California mines.
1867.....						3,184	47,000
1868.....						1,234	47,728
1869.....						1,580	33,811
1870.....						1,220	30,077
1871.....						2,810	31,686
1872.....						1,830	31,621
1873.....						5,231	27,642
1874.....						3,388	27,756
1875.....	412					11,489	50,250
1876.....	387					22,063	72,716
1877.....	505					20,101	79,395
1878.....	1,366					17,361	63,880
1879.....	1,455					23,587	73,684
1880.....	1,279					8,270	59,926
1881.....	1,065					5,812	60,851
1882.....	2,124					1,379	52,732
1883.....	1,689					185	46,725
1884.....	332					1,186	31,913
1885.....	446					427	32,073
1886.....	735					786	29,981
1887.....	689	1,543				520	^a 33,825
1888.....	1,151	3,848				992	33,260
1889.....	1,345	1,874				924	26,464
1890.....	1,046	1,290				737	22,926
1891.....	1,660	1,686				2,451	22,904
1892.....	1,630	3,208	1,592		672	812	27,993
1893.....	1,445	5,211	3,795		133	578	30,164
1894.....	1,368	4,214	3,575		1,200		30,416
1895.....	1,813	3,900	3,300	3,926	1,223	466	36,067
1896.....	1,126	1,114	3,800	4,205	1,200	1,340	30,765
1897.....	^b 1,538	375	3,600	838	475	1,101	26,691
1898.....	1,704		3,450	4,032	500	1,519	31,092
Total ..	28,290	28,263	23,112	13,001	5,403	192,566	1,801,568

^a Includes 66 flasks from Oregon.^b Including Mount Jackson.

IMPORTS.

In the following table is given a statement of the imports of quicksilver from 1867 to 1898:

Quicksilver imported and entered for consumption in the United States, 1867 to 1898, inclusive.

Year ending—	Quantity.	Value.	Year ending—	Quantity.	Value.
June 30—	Pounds.		June 30—	Pounds.	
1867.....		\$15, 248	1884.....	136, 615	\$44, 035
1868.....	152	68	1885.....	257, 659	90, 416
1869.....		11	Dec. 31—		
1870.....	239, 223	107, 646	1886.....	629, 888	249, 411
1871.....	304, 965	137, 332	1887.....	419, 934	171, 431
1872.....	370, 353	189, 943	1888.....	132, 850	56, 997
1873.....	99, 898	74, 146	1889.....	341, 514	162, 064
1874.....	51, 202	52, 093	1890.....	802, 871	445, 807
1875.....	6, 870	20, 957	1891.....	123, 966	61, 355
1876.....	78, 902	50, 164	1892.....	96, 318	40, 133
1877.....	38, 250	19, 558	1893.....	41, 772	17, 400
1878.....	294, 207	135, 178	1894.....	7	6
1879.....	519, 125	217, 707	1895.....	15, 001	7, 008
1880.....	116, 700	48, 463	1896.....	305	118
1881.....	138, 517	57, 733	1897.....	45, 539	20, 147
1882.....	597, 898	233, 057	1898.....	81	51
1883.....	1, 552, 738	593, 367			

PRICES.

The highest and lowest prices for quicksilver in London and San Francisco during a period of forty-nine years is shown in the following table:

Highest and lowest prices of quicksilver during the last forty-nine years.

[Per flask.]

Year.	Price in San Francisco.		Price in London.		
	Highest.	Lowest.	Highest.	Lowest.	
			£ s. d.	£ s. d.	
1850.....	\$114. 75	\$84. 15	15 0 0	13 2 6	
1851.....	76. 50	57. 35	13 15 0	12 5 0	
1852.....	61. 20	55. 45	11 10 0	9 7 6	
1853.....	55. 45	55. 45	8 15 0	8 2 6	
1854.....	55. 45	55. 45	7 15 0	7 5 0	
1855.....	55. 45	51. 65	6 17 6	6 10 0	
1856.....	51. 65	51. 65	6 10 0	6 10 0	
1857.....	53. 55	45. 90	6 10 0	6 10 0	
1858.....	49. 75	45. 90	7 10 0	7 5 0	

QUICKSILVER.

275

Highest and lowest prices of quicksilver during the last forty-nine years—Continued.

Year.	Price in San Francisco.		Price in London.			
	Highest.	Lowest.	Highest.		Lowest.	
			£	s. d.	£	s. d.
1859.....	\$76.50	\$49.75	7	5 0	7	0 0
1860.....	57.35	49.75	7	0 0	7	0 0
1861.....	49.75	34.45	7	0 0	7	0 0
1862.....	38.25	34.45	7	0 0	7	0 0
1863.....	45.90	38.25	7	0 0	7	0 0
1864.....	45.90	45.90	9	0 0	7	10 0
1865.....	45.90	45.90	8	0 0	7	17 6
1866.....	57.35	45.90	8	0 0	6	17 0
1867.....	45.90	45.90	7	0 0	6	16 0
1868.....	45.90	45.90	6	17 0	6	16 0
1869.....	45.90	45.90	6	17 0	6	16 0
1870.....	68.85	45.90	10	0 0	6	16 0
1871.....	68.85	57.35	12	0 0	9	0 0
1872.....	66.95	65.00	13	0 0	10	0 0
1873.....	91.80	68.85	20	0 0	12	10 0
1874.....	118.55	91.80	26	0 0	19	0 0
1875.....	118.55	49.75	24	0 0	9	17 6
1876.....	53.55	34.45	12	0 0	7	17 6
1877.....	44.00	30.60	9	10 0	7	2 6
1878.....	35.95	29.85	7	5 0	6	7 6
1879.....	34.45	25.25	8	15 0	5	17 6
1880.....	34.45	27.55	7	15 0	6	7 6
1881.....	31.75	27.90	7	0 0	6	2 6
1882.....	29.10	27.35	6	5 0	5	15 0
1883.....	28.50	26.00	5	17 6	5	5 0
1884.....	35.00	26.00	6	15 0	5	2 6
1885.....	33.00	28.50	6	15 0	5	10 0
1886.....	39.00	32.00	7	10 0	5	16 3
1887.....	50.00	36.50	11	5 0	6	7 6
1888.....	47.00	36.00	10	0 0	6	12 6
1889.....	50.00	40.00	9	15 0	7	10 0
1890.....	58.00	47.00	10	10 0	9	1 0
1891.....	51.00	39.50	8	12 6	7	5 0
1892.....	47.50	41.50	7	10 0	6	2 6
1893.....	43.50	30.00	6	17 6	6	2 0
1894.....	37.00	28.50	6	15 0	5	7 6
1895.....	41.00	35.90	7	10 0	6	10 0
1896.....	40.00	36.00	7	7 6	6	7 6
1897.....	40.50	36.50	7	7 6	6	12 6
1898.....	40.00	30.00				
Extreme range	118.55	25.25	26	0 0	5	2 6

NICKEL AND COBALT.

PRODUCTION.

The domestic supply of nickel and cobalt in 1898, as for the last two or three years, was obtained as a by-product in the smelting of lead at Mine La Motte, Missouri. The product of nickel in 1898 was 11,145 pounds—less than half that of 1897, and the smallest yearly output, with two exceptions, since 1887. The value decreased in slightly less proportion from \$7,823 in 1897 to \$3,956 in 1898.

The production of cobalt oxide fell off nearly 70 per cent—from 19,520 pounds in 1897 to 6,247 pounds in 1898. The value declined from \$31,232 to \$11,772, indicating a slight advance in price.

Interest in the nickel industry continues to center in the production of the metal in Canada and the importations from that country into the United States. The imports consist almost entirely of nickel matte, the bulk of which is from Canada and which contains about 20 per cent nickel. The amount imported in 1898 was notably larger than in any year in our history, being more than twice that received in 1897 and equal to more than 50 per cent of the total amount imported in the preceding decade.

The following tables show the production of nickel and of cobalt oxide in the United States during the years stated:

Production of nickel from domestic ores in the United States during the years 1887 to 1898.

Year.	Quantity.	Value.
	<i>Pounds.</i>	
1887.....	205,566	\$133,200
1888.....	204,328	127,632
1889.....	252,663	151,598
1890.....	223,488	134,093
1891.....	118,498	71,099
1892.....	92,252	50,739
1893.....	49,399	22,197
1894.....	9,616	3,269
1895.....	10,302	3,091
1896.....	17,170	4,461
1897.....	23,707	7,823
1898.....	11,145	3,956

Production of cobalt oxide in the United States, 1869 to 1898.

Year.	Quantity.	Year.	Quantity.	Year.	Quantity.
	<i>Pounds.</i>		<i>Pounds.</i>		<i>Pounds.</i>
1869.....	811	1879.....	4,376	1889.....	13,955
1870.....	3,854	1880.....	7,251	1890.....	6,788
1871.....	5,086	1881.....	8,280	1891.....	7,200
1872.....	5,749	1882.....	11,653	1892.....	7,869
1873.....	5,128	1883.....	1,096	1893.....	8,422
1874.....	4,145	1884.....	2,000	1894.....	6,763
1875.....	3,441	1885.....	8,423	1895.....	14,458
1876.....	5,162	1886.....	8,689	1896.....	10,700
1877.....	7,328	1887.....	^a 18,340	1897.....	19,520
1878.....	4,508	1888.....	8,491	1898.....	6,247

^a Including cobalt oxide in ore and matte.

IMPORTS AND EXPORTS.

In the following tables are given the statistics of the imports of cobalt oxide and of nickel into the United States from 1868 to 1898:

Cobalt oxide imported and entered for consumption in the United States, 1868 to 1898.

Year ending—	Oxide.		Year ending—	Oxide.	
	Quantity.	Value.		Quantity.	Value.
June 30—	<i>Pounds.</i>		June 30—	<i>Pounds.</i>	
1868.....		\$7,208	1884.....	25,963	\$43,611
1869.....		2,330	1885.....	16,162	28,138
1870.....		5,019	Dec. 31—		
1871.....		2,766	1886.....	19,366	29,543
1872.....		4,920	1887.....	26,882	39,396
1873.....	1,480	4,714	1888.....	27,446	46,211
1874.....	1,404	5,500	1889.....	41,455	82,332
1875.....	678	2,604	1890.....	33,338	63,202
1876.....	4,440	11,180	1891.....	23,643	43,188
1877.....	19,752	11,056	1892.....	32,833	60,067
1878.....	2,860	8,693	1893.....	28,884	42,694
1879.....	7,531	15,208	1894.....	24,020	29,857
1880.....	9,819	18,457	1895.....	36,155	39,839
1881.....	21,844	13,837	1896.....	27,180	36,212
1882.....	17,758	12,764	1897.....	24,771	34,773
1883.....	13,067	22,323	1898.....	33,731	49,245

NICKEL AND COBALT.

279

Nickel imported and entered for consumption in the United States, 1868 to 1898.

Year ending—	Nickel.		Nickel oxide, alloy of nickel with copper, and nickel matte.		Total value.
	Quantity.	Value.	Quantity.	Value.	
June 30—	Pounds.		Pounds.		
1868.....		\$118,058			\$118,058
1869.....		134,327			134,327
1870.....		99,111			99,111
1871.....	17,701	48,133	4,438	\$3,911	52,044
1872.....	26,140	27,144			27,144
1873.....	2,842	4,717			4,717
1874.....	3,172	5,883			5,883
1875.....	1,255	3,157	12	36	3,193
1876.....			156	10	10
1877.....	5,978	9,522	716	824	10,346
1878.....	7,486	8,837	8,518	7,847	16,684
1879.....	10,496	7,829	8,314	5,570	13,399
1880.....	38,276	25,758	61,869	40,311	66,069
1881.....	17,933	14,503	135,744	107,627	122,130
1882.....	22,906	17,924	177,822	125,736	143,660
1883.....	19,015	13,098	161,159	119,386	132,484
1884.....			^a 194,711	129,733	129,733
1885.....			105,603	64,166	64,166
Dec. 31—					
1886.....			277,112	141,546	^b 141,546
1887.....			439,037	205,232	^c 205,232
1888.....			316,895	138,290	^d 138,290
1889.....			367,288	156,331	^e 156,331
1890.....	^f 566,571	260,665	247,299	115,614	376,279
1891.....	355,455	172,476	^g 10,245,200	148,687	321,163
1892.....			^h 4,487,890	428,062	428,062
1893.....			^h 12,427,986	386,740	386,740
1894.....			^h 9,286,733	310,581	310,581
1895.....			^h 20,355,749	629,910	629,910
1896.....			^h 23,718,411	620,425	620,425
1897.....			^h 27,821,232	781,483	781,483
1898.....			^h 60,090,240	1,534,262	1,534,262

^a Including metallic nickel.^b Including \$465 worth of manufactured nickel.^c Including \$879 worth of manufactured nickel.^d Including \$2,281 worth of manufactured nickel.^e Including \$131 worth of manufactured nickel.^f Classified as nickel, nickel oxide, alloy of any kind in which nickel is the element or material of chief value.^g Classified as nickel and nickel matte.^h Includes all nickel imports except manufactures; nearly all of this is nickel in matte from Canada, containing about 20 per cent nickel.

MINERAL RESOURCES.

Exports of nickel oxide and matte from the United States from 1894 to 1898.

Year.	Quantity.	Value.
	<i>Pounds.</i>	
1894 (a)	1, 235, 588	\$247, 568
1895	1, 061, 285	239, 897
1896	2, 756, 604	606, 833
1897	4, 255, 558	997, 391
1898	5, 657, 620	1, 359, 609

a Latter six months; not separately classified prior to July 1, 1894.

FOREIGN PRODUCTION.

In view of the fact that the United States obtains its chief supply of nickel from Canada, the following statement of production in that country since 1889 will be of interest. It should be observed that in this table the statistics are for metallic nickel, while in the table of imports into the United States the quantity of nickel matte is given.

Outside of Canada the principal producers of nickel are France and Germany. Statements of the production in these countries from 1886 to 1897 are appended:

Production of nickel in Canada from 1889 to 1898.

Year.	Quantity.	Value.
	<i>Pounds.</i>	
1889	830, 477	\$498, 286
1890	1, 435, 742	933, 232
1891	4, 626, 627	2, 775, 976
1892	2, 413, 717	1, 399, 956
1893	3, 992, 982	2, 076, 351
1894	4, 907, 430	2, 061, 120
1895	3, 888, 525	1, 360, 984
1896	3, 397, 113	1, 188, 990
1897	3, 997, 746	1, 399, 137
1898	5, 517, 690	1, 820, 838

NICKEL AND COBALT.

281

Production of nickel in France from 1886 to 1897.

Year.	Quantity.	Value.	
	<i>Metric tons.</i>	<i>Francs.</i>	
1886.....	30	180,000	\$34,200
1887.....	30	180,000	34,200
1888.....	30	210,000	39,900
1889.....	330	1,710,000	324,900
1890.....	330	1,670,000	317,300
1891.....	330	1,680,000	319,200
1892.....	1,244	6,182,000	1,174,580
1893.....	2,045	6,188,000	1,175,720
1894.....	1,545	6,188,000	1,175,720
1895.....	1,545	5,438,000	1,033,220
1896.....	1,545	4,607,000	875,330
1897.....	1,245	3,707,500	704,425

Production of nickel in Germany (Prussia) from 1886 to 1897.

Year.	Quantity.	Value.
	<i>Metric tons.</i>	
1886.....	169	\$179,930
1887.....	169	179,930
1888.....	288	273,030
1889.....	282	279,680
1890.....	434	436,430
1891.....	594	644,480
1892.....	747	698,630
1893.....	893	774,630
1894.....	522	449,350
1895.....	698	575,890
1896.....	822	666,900
1897.....	898	710,980

ANTIMONY.

By EDWARD W. PARKER.

PRODUCTION.

Antimony ore (stibnite) was mined in four States in 1898, all in or west of the Rocky Mountains. These four States were California, Idaho, Nevada, and Utah. The production of ore amounted in 1898 to 697 short tons. Out of this product 380 tons, ranging from 53 to 65 per cent antimony, were sold as ore, the total value of which was \$9,900; 285 tons were concentrated before being marketed, the value of the concentrates being placed at \$3,000, and 32 tons were on hand at the close of the year. Returns from the smelting companies show that 500 short tons of domestic ore were treated by them, a little less than 20 per cent of the total amount of ore smelted, the other 80 per cent being received from foreign countries. The total amount of ore (domestic and imported) smelted was 2,550 short tons, yielding 1,050 short tons of metallic antimony or regulus, valued at \$172,500 at the smelters in San Francisco and New York. The production of regulus in 1897 amounted to 756 tons, valued at \$109,655, so that the output in 1898 exhibited an increase over the preceding year of 294 tons, or 39 per cent in quantity, and \$62,845 or 57 per cent in value. The proportionally larger increase in value in 1898 is the natural result of the improved business conditions which obtained throughout the year, and is the first exception to a steady decline in values for eight years. The increased demand for copper, lead, and zinc in 1898 naturally created a similarly increased demand for antimony, which is used with the other metals to a considerable extent in the manufacture of various alloys, and this is reflected in the increased production and advance in price.

In addition to the production of antimony in 1898 there was included in the output of antimonial lead 134,000 pounds of antimony which is not considered in the above statements. The antimony contents of antimonial lead produced in 1897 was 175,552 pounds, compared with which the output in 1898 shows a decrease of 41,552 pounds.

Since 1894 the bulk of the metallic antimony produced in the United States has been obtained from imported ores, the domestic ore supply being heretofore uncertain and comparatively small. It was to overcome this disadvantage to its business that the largest antimony

smelting concern removed in 1894 from San Francisco to Staten Island, in order that it could more readily command a steady supply of ore, and it will be observed that the production has steadily increased each year, and that the industry, while necessarily a small one as compared with that of lead, or copper, or zinc, has developed quite rapidly in the last four years. Comparing the production in 1898 with that of the earlier years, of which the only records are contained in the volumes of Mineral Resources, it is shown that from 1880 to 1886 the value of the product did not exceed \$12,000 in any one year, whereas in 1898, including antimonial lead, the value of the product was \$184,050, more than 15 times the largest value prior to 1887. Since that year the production has shown an increasing tendency, the only exceptions in twelve years being in 1893 and 1894, the smaller production in the latter year being due to the interruptions to work occasioned by the removal of the smelter referred to above, and it is probable that the small output in 1893 was due to the preparations for removal.

Considering the production by quantity, it is seen by the following statement that from 1880 to 1887 the product did not exceed 75 tons in any one year and in 1886 was as small as 35 tons. During the next seven years it averaged a little over 200 tons per year. In 1895 it increased 125 per cent over the preceding year. In 1896 the product was 33½ per cent more than in 1895, and a further increase of 25 per cent, excluding antimonial lead, was recorded for 1897. In 1898 the product of metallic antimony showed another gain of 39 per cent, while a decrease of 18 tons is shown in the antimony contained in antimonial lead.

In the following table is shown the annual production of antimony in the United States since 1880:

Production of antimony in the United States since 1880.

Year.	Quantity.	Value.	Year.	Quantity.	Value.
	<i>Short tons.</i>			<i>Short tons.</i>	
1880.....	50	\$10,000	1892:		
1881.....	50	10,000	Metallic..	150	\$56,466
1882.....	60	12,000	Ore	380	
1883.....	60	12,000	1893.....	250	45,000
1884.....	60	12,000	1894.....	200	36,000
1885.....	50	10,000	1895.....	a 450	68,000
1886.....	35	7,000	1896.....	a 601	84,290
1887.....	75	15,000		a 756	109,655
1888.....	100	20,000	1897.....	b 88	12,289
1889.....	115	28,000		a 1,050	172,500
1890.....	129	40,756	1898.....	b 70	11,550
1891.....	278	47,007			

a Principally from imported ores.

b Antimony contained in antimonial lead.

RECENT DEVELOPMENTS.

Considerable attention, it is reported, is now being given to the antimony developments in the Coyoto district in Utah, 200 tons out of the 380 tons of ore sold in 1898 being from this recently developed district. About 70 per cent of the ore shipped in 1898 went to San Francisco and 30 per cent to New York. Mr. E. W. Penney has sent to this office some promising looking specimens of stibnite. Mr. Penney states that the ore exists in large quantities, but present mining methods, which consist of stripping, are expensive, and additional expense is incurred in getting the ore by pack trains to railroad transportation. The ore lies above a quartz conglomerate and a dolomite limestone, and is said to contain 60 per cent antimony.

A discovery of what is claimed to be native antimony is reported from Minnesota, but no work in the way of development has been done upon the property.

IMPORTS.

As will be seen from the following table the antimony of domestic production supplies a very small proportion of the consumption. The value of the domestic product has exceeded \$50,000 in five years only, while the imports have fallen below \$200,000 only four times in the last eighteen years, and have exceeded \$400,000 twice in that time.

Antimony and antimony ore imported and entered for consumption in the United States, 1867 to 1898.

Year ending—	Crude and regulus.		Ore.		Total value.
	Quantity.	Value.	Quantity.	Value.	
	<i>Pounds.</i>		<i>Pounds.</i>		
June 30, 1867..	.....	\$63,919	.....	.....	\$63,919
1868..	1,033,336	83,822	.....	.....	83,822
1869..	1,345,921	129,918	.....	.....	129,918
1870..	1,227,429	164,179	.....	.....	164,179
1871..	1,015,039	148,264	.....	\$2,364	150,628
1872..	1,933,306	237,536	.....	3,031	240,567
1873..	1,166,321	184,498	.....	2,941	187,439
1874..	1,253,814	148,409	.....	203	148,612
1875..	1,238,223	131,360	6,460	609	131,969
1876..	946,809	119,441	8,321	700	120,141
1877..	1,115,124	135,317	20,001	2,314	137,631
1878..	1,256,624	130,950	20,351	1,259	132,209
1879..	1,380,212	143,099	34,542	2,341	145,440
1880..	2,019,389	265,773	25,150	2,349	268,122
1881..	1,808,945	253,054	841,730	18,199	271,253
1882..	2,525,838	294,234	1,114,699	18,019	312,253

*Antimony and antimony ore imported and entered for consumption in the United States,
1867 to 1898—Continued.*

Year ending—	Crude and regulus.		Ore.		Total value.
	Quantity.	Value.	Quantity.	Value.	
	<i>Pounds.</i>		<i>Pounds.</i>		
June 30, 1883..	3, 064, 050	\$286, 892	697, 244	\$11, 254	\$298, 146
1884..	1, 779, 337	150, 435	231, 360	6, 489	156, 924
1885..	2, 579, 840	207, 215	215, 913	7, 497	214, 712
Dec. 31, 1886..	2, 997, 985	202, 563	218, 366	9, 761	212, 324
1887..	2, 553, 284	169, 747	362, 761	8, 785	178, 532
1888..	2, 814, 044	248, 015	68, 040	2, 178	250, 193
1889..	2, 676, 130	304, 711	146, 309	5, 568	310, 279
1890..	3, 315, 659	411, 960	611, 140	29, 878	441, 838
1891..	2, 618, 941	327, 307	1, 433, 531	36, 232	363, 539
1892..	3, 950, 864	392, 761	192, 344	7, 338	400, 099
1893..	2, 780, 432	243, 341	116, 495	5, 253	248, 594
1894..	2, 653, 487	193, 988	375, 468	^a 18, 805	212, 793
1895..	3, 499, 901	223, 968	668, 610	14, 718	238, 686
1896..	2, 576, 371	158, 975	1, 180, 828	21, 402	180, 377
1897..	2, 282, 245	143, 370	3, 719, 186	55, 400	198, 770
1898..	2, 103, 599	148, 671	3, 749, 222	50, 256	198, 927

^a Includes \$737, value of ground antimony for which no quantity was given.

PRICES.

A review of the prices of antimony ruling during the past nine years shows a history of steady decline for six years consecutively, a slight recovery in 1897, and a decided improvement in 1898. At the beginning of 1890 the price for Cookson's brand was 22½ cents per pound. During 1895 the price ranged from 7¾ to 8½ cents, and in 1896 a shade lower than this. It will thus be seen that in five years there was a decline of over 66¾ per cent in price. From 1892 to 1897 the decline was about 50 per cent. In January of 1892 Cookson's was quoted at 15½ to 16 cents per pound. By December the price had fallen to 11½ cents. During 1893 prices continued to decline slowly until 10 cents was reached, and in 1894, under continued depression, 8½ cents was quoted before the close of the year. The lowest price reached in 1895 was 7¾ cents; in 1896, 7½ cents, and fell to 7 cents during July and August, 1897. The latter part of 1897 showed a slight improvement, the lowest price for Cookson's during the last four months of the year being 8 cents, and the highest 8½ cents per pound. In sympathy with the business revival and general advance in values in 1898, the prices of antimony advanced until Cookson's was quoted in the last half at from 9½ to 9¾ cents. The lowest price quoted for this brand was 8 cents in January, February, and March.

ANTIMONY.

287

The following tables show by months and years the ruling prices of the several brands of antimony as reported to the *Iron Age* from 1892 to 1897, inclusive:

Prices of antimony at New York since 1892, by months.

[Cents per pound.]

Month.	1892.			1893.		
	Cookson's.	L. X.	Hallett's.	Cookson's.	L. X.	Hallett's.
January	15½ to 16	12 to 15	12½ to 12¾	11	10½	10½
February	15 to 15½	12 to 14	11½	10½	10½	9½ to 10
March	14½ to 15	11½ to 13	10½ to 11½	10½	10 to 12	10
April	14½ to 15½	12½ to 12¾	10½ to 11	10½	10½	10
May	15	12½	11½	10½	10½	10
June	14½	12½	11½	10½	10½	9½
July	13½	12½	10½	10½	10½	9½
August	12	11½	10½	10½	10	9½
September	11½ to 11¾	11 to 11½	10 to 10½	10½	10	9½
October	12	11½	10½ to 10¾	10½	10	9½
November	11½	11	10½	10	9½	9½
December	11½	11	10½ to 10¾	10½ to 10¾	9½ to 9¾	9½ to 9¾

Month.	1894.			1895.		
	Cookson's.	Hallett's.	L. X.	Cookson's.	Hallett's.	Japanese.
January	10½	9½	9½	8½ to 8¾	7½ to 7¾	.....
February	10	9½	8¾	8½ to 8¾	7½ to 7¾	.....
March	10½	9½	8¾	8½	7½ to 7¾	.....
April	10½	9½	8¾	7½ to 8½	7 to 7½	6½ to 7
May	10½	9½	8¾	7½ to 8	7	6½
June	9½	9½	8¾	7½ to 8	7 to 7½	6½
July	10	8½	8¾	8 to 8½	7½ to 7¾	7
August	10	8½	8½	8	7½	7
September	9½	8½	7¾	8	7½	6½ to 7
October	9½	8½	7¾	7½ to 8	7 to 7½	6½
November	8½	8½	7¾	7½ to 7¾	7	6½ to 6¾
December	8½	8½	7¾	7½ to 7¾	6½ to 7	6½ to 6¾

Prices of antimony at New York since 1892, by months—Continued.

Month.	1896.			1897.		
	Cookson's.	Hallett's.	Japanese.	Cookson's.	Hallett's.	Japanese.
January	8½	7½ to 7½	7	7½ to 7½	6½ to 6½	6½ to 6½
February	8½	7½	7	7½ to 7½	6½ to 6½	6½ to 6½
March	8½	7½	7	7½ to 7½	6½ to 7½	6½ to 7
April	8½	7½	7	7½ to 7½	7 to 7½	7 to 7½
May	8 to 8½	7½ to 7½	6½ to 7	7½ to 7½	7 to 7½	6½ to 7½
June	8	7½	6½ to 7	7½ to 7½	6½ to 7	6½ to 6½
July	8	7½	6½ to 7	7 to 7½	6½ to 7½	6½
August	8	7½	6½ to 7	7 to 8½	7½ to 7½	6½ to 7
September	8	7½	6½ to 7	8 to 8½	7½ to 7½	7 to 7½
October	7½ to 7½	6½	6½	8 to 8½	7½ to 7½	7 to 7½
November	7½ to 7½	6½ to 6½	6½ to 6½	8 to 8½	7½ to 7½	7 to 7½
December	7½ to 7½	6½	6½	8 to 8½	7½ to 7½	7 to 7½

Month.	1898.		
	Cookson's.	Hallett's.	Japanese.
January	8 to 8½	7½ to 7½	7½ to 7½
February	8 to 8½	7½ to 7½	.....
March	8 to 8½	7½ to 7½	.....
April	8½ to 9	7½ to 8	.....
May	9½ to 9½	8½ to 8½	8½
June	9½ to 9½	8½ to 9	8½ to 9
July	9½ to 9½	9	9
August	9½ to 9½	9	9
September	9½ to 9½	9	9
October	9½ to 9½	9	9
November	9½ to 9½	9	8½ to 9
December	9½ to 9½	8½ to 9	8½ to 8½

USES.

Antimony is chiefly valuable as an alloy with other metals. It is used to large extent with lead in the manufacture of type metal, to which it gives hardness, and, what is more valuable, it possesses the peculiarity, when used as an alloy, of expanding at the moment of solidifying, thus giving to the type a clean, sharp impression. From 10 to 16 parts of antimony in 100 are used in making britannia metal. Pewter contains about 7 per cent. It is also used in the manufacture of babbitt metal, an antifriction alloy used in the journals of railroad

locomotives and cars and other rapidly moving machinery. It has lately been used as alloy with aluminum, to which it gives hardness and elasticity. Its effects on some metals is very injurious, particularly copper, an almost inappreciable amount (one part in a thousand) destroying its good qualities. The well-known medicinal preparation, tartar emetic, is a tartrate of antimony and potassium. The trisulphide is also used to some extent in medical practice. The sulphide was used to considerable extent by the ancients as a pigment, and women of the East are said to use it at the present day for darkening their eyebrows.

CHROMIC IRON ORE.

The mining of chromic iron ore in California ceased in 1897 and has not been resumed, owing to the fact that richer ore at lower prices and in more regular supply can be obtained from Asia Minor, whose deposits were described in the report for 1897.

PRODUCTION.

The production in the United States since 1885 has been as follows:

Production of chromic iron ore in the United States since 1885.

Year.	Quantity.	Value.	Year.	Quantity.	Value.
	<i>Long tons.</i>			<i>Long tons.</i>	
1885.....	2, 700	\$40, 000	1892.....	1, 500	\$25, 000
1886.....	2, 000	30, 000	1893.....	1, 450	21, 750
1887.....	3, 000	40, 000	1894.....	3, 680	53, 231
1888.....	1, 500	20, 000	1895.....	1, 740	16, 795
1889.....	2, 000	30, 000	1896.....	786	6, 667
1890.....	3, 599	53, 985	1897.....	None.	.....
1891.....	1, 372	20, 580	1898.....	None.	.....

IMPORTS.

The following table shows the imports of chrome ore, chromate and bichromate of potash, and chromic acid imported and entered for consumption into the United States from 1867 to 1898:

Chromate and bichromate of potash, chromic acid, and chrome ore imported and entered for consumption in the United States, 1867 to 1898, inclusive.

Years ending—	Chromate and bichromate of potash.		Chromic acid.		Chrome ore.		Total value.
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	
June 30—	Pounds.		Pounds.		Longtons.		
1867.....	875,205	\$88,787	.....	.....	.....	.....	\$88,787
1868.....	777,855	68,634	.....	.....	.....	.....	68,634
1869.....	877,432	78,288	.....	\$3	.....	.....	78,291
1870.....	1,235,946	127,333	.....	8	.....	.....	127,341
1871.....	2,170,473	223,529	.....	5	.....	.....	223,534
1872.....	1,174,274	220,111	514	49	.....	.....	220,160
1873.....	1,121,357	178,472	922	276	.....	.....	178,748
1874.....	1,387,051	218,517	44	13	.....	.....	218,530
1875.....	1,417,812	183,424	45	22	.....	.....	183,446
1876.....	1,665,011	175,795	120	45	.....	.....	175,840
1877.....	2,471,669	264,392	13	10	.....	.....	264,402
1878.....	1,929,670	211,136	32	35	.....	.....	211,171
1879.....	2,624,403	221,151	.....	.....	.....	.....	221,151
1880.....	3,505,740	350,279	5	3	.....	.....	350,282
1881.....	4,404,237	402,068	124	89	.....	.....	402,177
1882.....	2,449,875	261,006	52	42	.....	.....	261,048
1883.....	1,990,140	206,681	290	338	.....	.....	209,019
1884.....	2,593,115	210,677	.....	120	2,677	\$73,586	284,383
1885.....	1,448,539	92,556	.....	39	12	239	92,834
Dec. 31—							
1886.....	1,985,809	139,117	.....	101	3,356	43,721	182,949
1887.....	1,722,465	120,305	.....	5,571	1,404	20,812	146,668
1888.....	1,755,489	143,312	.....	281	4,440	46,735	190,328
1889.....	1,580,385	137,263	.....	2,974	5,474	50,782	191,019
1890.....	1,304,185	113,613	.....	634	4,353	57,111	171,358
1891.....	755,254	55,897	634	203	4,459	108,764	165,297
1892.....	496,972	94,055	772	204	4,930	55,579	149,838
1893.....	976,706	78,981	3,708	641	6,354	58,629	138,251
1894.....	1,483,762	125,796	5,680	837	3,470	38,364	164,997
1895.....	2,045,910	181,242	2,083	414	5,230	82,845	264,501
1896.....	952,794	80,538	2,429	387	8,669	187,400	268,325
1897.....	1,329,473	108,497	71,220	5,457	11,570	187,439	301,393
1898.....	1,160,710	86,134	5,329	1,758	16,304	272,234	360,126

PLATINUM.

PRODUCTION.

The product of platinum during 1898, as in 1897, in the United States came chiefly from Trinity and Shasta counties, California, and amounted to about 225 ounces, worth in the crude state \$3,375.

The production since 1880 has been as follows:

Product of platinum in the United States since 1880.

Year.	Quantity.	Value. (a)
	<i>Ounces.</i>	
1880.....	100	\$400
1881.....	100	400
1882.....	200	600
1883.....	200	600
1884.....	150	450
1885.....	250	187
1886.....	50	100
1887.....	448	1,838
1888.....	500	2,000
1889.....	500	2,000
1890.....	600	2,500
1891.....	100	500
1892.....	80	550
1893.....	75	517
1894.....	100	600
1895.....	150	900
1896.....	163	944
1897.....	150	900
1898.....	225	3,375

a The chief variations in price have been due to the quality of the crude grains.

COAL.

By EDWARD W. PARKER.

INTRODUCTION.

The report presented in the subsequent pages deals primarily with the statistics of coal production in 1898, and is, in the main, uniform in character with the preceding ones of the series. It has been deemed advisable, however, to condense somewhat the tabulated statements, particularly in regard to the production in the several States by counties, which, in this report, is confined to the last three or four years. Reference to the reports for 1896 and 1897 will supply the history of county production in earlier years, if desired, and it is not considered necessary to continue these lengthy tables.

In the preparation of this report the methods previously adopted have been continued. The statistics of production in the several States have been compiled from direct returns to the Survey or its duly appointed agents, with one exception. As formerly, the report for Illinois is taken from the report of the State Bureau of Labor Statistics. The report on the production of anthracite coal in Pennsylvania has, as usual, been prepared by Mr. William W. Ruley, of Philadelphia, chief of the Bureau of Anthracite Coal Statistics and special agent of the Geological Survey. Cooperation in the work has been rendered by Mr. R. M. Haseltine, chief inspector of mines of Ohio; Mr. Robert Brownlee, of the Bureau of Industrial Statistics of Pennsylvania; Mr. G. W. Stone, mine inspector of Kentucky, and Messrs. H. Foster Bain and S. W. Beyer, of the Iowa Geological Survey, in obtaining statements of the production at collieries in those States which had failed to reply to the inquiries from this office. The assistance rendered by these gentlemen is gratefully acknowledged. The work of preparing the statistical tables has for a number of years been performed by Mr. Theodore H. Johnson, whose efficient services have contributed in a large degree to the completeness of the report and the promptness of its publication. The increasing willingness of the coal operators to furnish the Survey with the statements of their production which has been shown each year has been exceedingly gratifying, and is taken as evidence that the producers realize more fully each year the value of the history of the past in providing for the questions of the present and the possibilities of the future.

In presenting the statistics of coal production in 1898, as set forth in the following pages, the writer desires to call attention to the complete-

ness of the returns. Including the reports obtained from State officials where any statements had not been received by this office, the aggregate tonnage actually reported represented the production of 3,171 mines out of a total of 3,202, leaving only 31 mines of commercial importance in the United States not reported. The production of these 31 mines was estimated according to their average output for the three or four years next preceding 1898, in which reports had been received from them. The aggregate tonnage added for these delinquents to the total product actually reported was 349,000 tons, or an average of 11,000 tons for each mine. If all of the mines whose product is thus estimated were idle in 1898, and did not produce a ton of coal, the aggregate output given in the report would be within 0.15 of 1 per cent of the actual production. There is of course a chance for possible error in the estimated figures which are given for the production of small mines. The facilities afforded this office do not admit of the canvassing of these comparatively unimportant contributors to the coal production. The total production for 1898 estimated from these sources is given at 1,836,500 tons. To obtain reports from these small mines would entail an expense larger than that which is necessary for collecting the statistics of production of the commercial coal mines. The percentage of error which may occur in these estimated figures would be about the same from year to year and consequently would not materially affect the total. In placing these figures before the public the author is satisfied that they are as accurate as it is possible to make them.

A special and interesting feature of these reports consists of a review of the coal trade at the important trade centers and shipping ports. This feature is composed chiefly of original contributions by secretaries of boards of trade, etc. These are gratefully acknowledged here, and by name and proper credit in connection with their contributions under the head of "Coal trade review." When any reference has been made to the files of technical journals due credit is given in the proper place.

The statistics relating to the production of bituminous coal by the use of mining machines, which were presented in the reports for 1896 and 1897, have been continued in this paper, and show some interesting features, which are discussed in connection with the tabulated statements. Strikes, except in Illinois, were comparatively few and of short duration.

Some confusion is apt to occur by the fact that both the long ton of 2,240 pounds and the short ton (2,000 pounds) are used in this chapter. This is unfortunate, but can not be avoided. Pennsylvania anthracite is always measured by the long ton. In cases where Pennsylvania bituminous coal is sold in the Eastern markets the long ton is used. The same is true of West Virginia and of the Tazewell and Wise County coals of Virginia. The laws of Maryland permit the use of the long ton only. In all other cases bituminous coal is sold by the short ton. For the sake of convenience the bituminous product has in this report been reduced to short tons, and when the anthracite and bitu-

minous products are tabulated together the short ton is used. In the section devoted entirely to Pennsylvania anthracite the long ton only is used, and in the table of shipments from the Cumberland region this is also the case.

THE COAL FIELDS OF THE UNITED STATES.

For convenience the coal areas of the United States are divided into two great classes—the anthracite and the bituminous.

In a commercial sense, particularly in the East, when the anthracite fields are mentioned the fields of Pennsylvania are considered, though Colorado and New Mexico are now supplying anthracite coal of good quality to the Rocky Mountain region, and small amounts are mined annually in Virginia. This small quantity from Virginia and a semi-anthracite product from Arkansas are considered with the bituminous output. In previous years some coal which was classed as anthracite has been mined and sold in New England. The productive area was confined to the eastern part of Rhode Island and the counties of Bristol and Plymouth, in Massachusetts. The classing of this product as anthracite coal was erroneous. The original beds have been metamorphosed into graphite or graphitic coal, and the product requires such a high degree of heat for combustion that it can be used only with other combustible material or under a heavy draft. It is, therefore, not an economical practice to use this product for fuel in competition with the anthracite coal from Pennsylvania or the bituminous coals from the New River and Pocahontas fields, which are now sent in large quantities to New England points, and its mining for fuel purposes has been abandoned.

The bituminous division includes the following coal fields: (1) The Triassic field, embracing the coal beds of the Triassic or New Red Sandstone formation in the Richmond basin in Virginia and in the coal basins along the Deep and Dan rivers in North Carolina; (2) the Appalachian field, which extends from the State of New York on the north to the State of Alabama on the south, having a length northeast and southwest of over 900 miles, and a width ranging from 30 to 180 miles; (3) the Northern field, which is confined exclusively to the central part of Michigan; (4) the Central field, embracing the coal areas in Indiana, Illinois, and western Kentucky; (5) the Western field, including the coal areas west of the Mississippi River, south of the forty-third parallel of north latitude, and east of the Rocky Mountains; (6) the Rocky Mountain field, containing the coal areas in the States and Territories lying along the Rocky Mountains; (7) the Pacific Coast field, embracing the coal districts of Washington, Oregon, and California.

The various fields are described at some length in Mineral Resources for 1886, and also in the report for 1894. The latter also contains some historical information regarding the development of these fields. Mineral Resources for 1892 contains some interesting contributions from State geologists on the coal fields of several States.

The following table contains the record of the production of the different fields since 1887. It shows that the output of anthracite coal, including the product of Colorado and New Mexico, has increased from 39,548,255 short tons in 1887, to 53,429,739 short tons in 1898. The production in the latter year, however, was not the maximum. The largest output of anthracite coal was obtained in 1895, when the product amounted to 58,066,516 short tons, 47 per cent more than the product of 1887. Several influences, which are discussed later, have combined to restrict the demand for and production of anthracite coal in Pennsylvania during the last three years, during which time it has remained practically stationary, with an average annual output of about 53,500,000 short tons, about 4,500,000 short tons less than that of 1895.

In the bituminous areas those of the Appalachian system are by far the most important. The product of these fields in 1887 was 55,193,034 short tons, or nearly 63 per cent of the total yield of bituminous coal. In 1898 the coal product of the Appalachian system was 114,239,156 short tons, 68.6 per cent of the total bituminous tonnage, and an increase of 59,046,122 short tons, or 107 per cent, over that of 1887. Second in importance is the Central field, containing the coal areas of Illinois, Indiana, and western Kentucky, which produced 14,478,883 short tons, or 16½ per cent of the total bituminous product in 1887, and 25,816,874 short tons, or 15.5 per cent, in 1898.

The Western field contains the coal-producing areas of Iowa, Missouri, Kansas, Arkansas, Indian Territory, and Texas. It is third in importance, with 11.6 per cent of the total in 1887, but only 8.4 per cent in 1898.

The greatest percentage of increase has been made in the Rocky Mountain field, in which 3,646,280 tons, or 4.15 per cent of the total, were mined in 1887, and 10,042,759 short tons, or 6 per cent, in 1898. The product of this field in 1898 was 2.8 times that of 1887. The Pacific coast field yielded not quite 1 per cent of the total product in 1887 and 1.26 per cent in 1898. The production of these five fields, with their percentages of the total bituminous output in 1887, 1897, and 1898, the increase and percentage of increase in each, was as follows:

Production of the five principal bituminous coal fields in 1887, 1897, and 1898 compared.

Field.	1887.		1897.		1898.		Increase in 1898 over 1887.	
	Product.	Per cent of total.	Product.	Per cent of total.	Product.	Per cent of total.	Amount.	Per cent.
	<i>Short tons.</i>		<i>Short tons.</i>		<i>Short tons.</i>		<i>Short tons.</i>	
Appalachian.....	55,193,034	63.0	97,128,220	65.8	114,239,156	68.6	59,046,122	107.0
Central.....	14,478,883	16.5	26,414,127	17.9	25,816,874	15.5	11,337,991	78.3
Western.....	10,193,034	11.6	13,164,059	8.9	13,988,436	8.4	3,795,402	8.7
Rocky Mountain	3,646,280	4.15	8,854,182	5.99	10,042,759	6.0	6,396,479	175.0
Pacific coast.....	854,308	1.0	1,639,779	1.11	2,103,043	1.26	1,248,735	146.0

The following table contains the approximate areas of the coal fields in the various States, grouped according to the divisions mentioned, with the total output from each from 1887 to 1898:

Classification of the coal fields of the United States.

	Area.	Product in—		
		1887.	1888.	1889.
<i>Anthracite.</i>	<i>Sq. miles.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
New England (Rhode Island and Massachusetts)	500	6,000	4,000	2,000
Pennsylvania	480	39,508,255	43,922,897	45,544,970
Colorado and New Mexico.	15	36,000	44,791	53,517
	995	39,548,255	43,971,688	45,600,487
<i>Bituminous. (a)</i>				
<i>Triassic:</i>				
Virginia	180	30,000	33,000	49,411
North Carolina.....	2,700	.....	.....	222
<i>Appalachian:</i>				
Pennsylvania	9,000	31,516,856	30,796,727	36,174,089
Ohio	10,000	10,301,708	10,910,951	9,976,787
Maryland	550	3,278,023	3,479,470	2,939,715
Virginia	2,000	795,263	1,040,000	816,375
West Virginia	16,000	4,881,620	5,498,800	6,231,880
Kentucky	11,180	950,903	1,193,000	1,108,770
Tennessee	5,100	1,900,000	1,967,297	1,925,689
Georgia	200	313,715	180,000	225,934
Alabama	8,660	1,950,000	2,900,000	3,572,983
	62,690	55,888,088	60,966,245	62,972,222
<i>Northern:</i>				
Michigan	6,700	71,461	81,407	67,431
<i>Central:</i>				
Indiana	6,450	3,217,711	3,140,979	2,845,057
Kentucky	4,500	982,282	1,377,000	1,290,985
Illinois	36,800	10,278,890	14,655,188	12,104,272
	47,750	14,478,883	19,173,167	16,240,314

a Including lignite, brown coal, and scattering lots of anthracite.

Classification of the coal fields of the United States—Continued.

	Area.	Product in—		
		1887.	1888.	1889.
<i>Bituminous (a)—Continued.</i>				
Western:	<i>Sq. miles.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
Iowa.....	18,000	4,473,828	4,952,440	4,045,358
Missouri.....	26,700	3,209,916	3,909,967	2,557,823
Nebraska.....	3,200	1,500	1,500	} 2,222,543
Kansas.....	17,000	1,596,879	1,850,000	
Arkansas.....	9,100	129,600	276,871	279,584
Indian Territory.....	20,000	685,911	761,986	752,832
Texas.....	4,500	75,000	90,000	128,216
	98,500	10,172,634	11,842,764	10,036,356
Rocky Mountain, etc.:				
Dakota.....		21,470	34,000	28,907
Montana.....		10,202	41,467	363,301
Idaho.....		500	400	
Wyoming.....		1,170,318	1,481,540	1,388,947
Utah.....		180,021	258,961	236,651
Colorado.....	2,913	1,755,735	2,140,686	2,544,144
New Mexico.....		508,034	626,665	486,463
		3,646,280	4,583,719	5,048,413
Pacific coast:				
Washington.....		772,612	1,215,750	1,030,578
Oregon.....		31,696	75,000	64,359
California.....		50,000	95,000	119,820
		854,308	1,385,750	1,214,757
Total product sold.....		124,689,909	142,037,740	
Colliery consumption.....		5,960,302	6,621,667	
Total product, including colliery consumption.....		130,650,211	148,659,407	141,229,613

a Including lignite, brown coal, and scattering lots of anthracite.

Classification of the coal fields of the United States—Continued.

	Product in—			
	1890.	1891.	1892.	1893.
<i>Anthracite.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
New England (Rhode Island and Massachusetts)		500		
Pennsylvania	46,468,641	50,665,431	52,472,504	53,967,543
Colorado and New Mexico	(a)	(a)	64,963	93,578
	46,468,641	50,665,931	52,537,467	54,061,121
<i>Bituminous. (b)</i>				
Triassic:				
Virginia	19,346	17,290	37,219	19,878
North Carolina	10,262	20,355	6,679	17,000
Appalachian:				
Pennsylvania	42,302,173	42,788,490	46,694,576	44,070,724
Ohio	11,494,506	12,868,683	13,562,927	13,253,646
Maryland	3,357,813	3,820,239	3,419,962	3,716,041
Virginia	764,665	719,109	637,986	800,461
West Virginia	7,394,484	9,220,665	9,738,755	10,708,578
Kentucky	1,206,120	1,222,918	1,231,110	1,245,785
Tennessee	2,169,585	2,413,678	2,092,064	1,902,258
Georgia	228,337	171,000	215,498	372,740
Alabama	4,090,409	4,759,781	5,529,312	5,136,935
	73,008,102	77,984,563	83,122,190	81,207,168
Northern:				
Michigan	74,977	80,307	77,990	45,979
Central:				
Indiana	3,305,737	2,973,474	3,345,174	3,791,851
Kentucky	1,495,376	1,693,151	1,794,203	1,761,394
Illinois	15,274,727	15,660,698	17,862,276	19,949,564
	20,075,840	20,327,323	23,001,653	25,502,809

a Included in bituminous product.

b Including lignite, brown coal, and scattering lots of anthracite.

Classification of the coal fields of the United States—Continued.

	Product in—			
	1890.	1891.	1892.	1893.
<i>Bituminous (a)—Cont'd.</i>				
Western:	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
Iowa	4, 021, 739	3, 825, 495	3, 918, 491	3, 972, 229
Missouri	2, 735, 221	2, 674, 606	2, 733, 949	2, 897, 442
Nebraska	2, 259, 922	1, 500	1, 500	.....
Kansas		2, 716, 705	3, 007, 276	2, 652, 546
Arkansas	399, 888	542, 379	535, 558	574, 763
Indian Territory	869, 229	1, 091, 032	1, 192, 721	1, 252, 110
Texas	184, 440	172, 100	245, 690	302, 206
	10, 470, 439	11, 023, 817	11, 635, 185	11, 651, 296
Rocky Mountain, etc.:				
Dakota	30, 000	30, 000	40, 725	49, 630
Montana	517, 477	541, 861	564, 648	892, 309
Wyoming	1, 870, 366	2, 327, 841	2, 503, 839	2, 439, 311
Utah	318, 159	371, 045	361, 013	413, 205
Colorado	3, 094, 003	3, 512, 632	3, 447, 967	4, 018, 793
New Mexico	375, 777	462, 328	659, 230	655, 112
	6, 205, 782	7, 245, 707	7, 577, 422	8, 468, 360
Pacific coast:				
Washington	1, 263, 689	1, 056, 249	1, 213, 427	1, 264, 877
Oregon	61, 514	51, 826	34, 661	41, 683
California	110, 711	93, 301	85, 178	72, 603
	1, 435, 914	1, 201, 376	1, 333, 266	1, 379, 163
Total product, including colliery consumption ...	157, 770, 963	168, 566, 669	179, 329, 071	182, 352, 774

a Including lignite, brown coal, and scattered lots of anthracite.

Classification of the coal fields of the United States—Continued.

	Product in—				
	1894.	1895.	1896.	1897.	1898.
<i>Anthracite.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
New England (Rhode Island and Massachu- setts)					
Pennsylvania	51,921,121	57,999,337	54,346,081	52,611,680	53,382,644
Colorado and New Mexico	71,550	67,179	79,492	69,076	47,095
	51,992,671	58,066,516	54,425,573	52,680,756	53,429,739
<i>Bituminous. (a)</i>					
Triassic:					
Virginia	52,079	57,782	96,670	95,670	38,938
North Caro- lina	16,900	24,900	7,813	21,280	
Appalachian:					
Pennsylvania	39,912,463	50,217,228	49,557,453	54,417,974	65,165,133
Ohio	11,909,856	13,355,806	12,875,202	12,196,942	14,516,867
Maryland	3,501,428	3,915,585	4,143,936	4,442,128	4,674,884
Virginia	1,177,004	1,310,542	1,159,053	1,432,632	1,787,831
West Virginia	11,627,757	11,387,961	12,876,296	14,248,159	16,700,999
Kentucky	1,218,072	1,490,057	1,486,016	1,411,897	1,591,076
Tennessee	2,180,879	2,535,644	2,663,106	2,888,849	3,022,896
Georgia	354,111	260,998	238,546	195,869	244,187
Alabama	4,397,178	5,693,775	5,748,697	5,893,770	6,535,283
	76,278,748	90,167,596	90,748,305	97,128,220	114,239,156
Northern:					
Michigan	70,022	112,322	92,882	223,592	315,722
Central:					
Indiana	3,423,921	3,995,892	3,905,779	4,151,169	4,920,743
Kentucky	1,893,120	1,867,713	1,847,462	2,190,200	2,296,832
Illinois	17,113,576	17,735,864	19,786,626	20,072,758	18,599,299
	22,430,617	23,599,469	25,539,867	26,414,127	25,816,874

a Including lignite, brown coal, and scattering lots of anthracite.

Classification of the coal fields of the United States—Continued.

	Product in—				
	1894.	1895.	1896.	1897.	1898.
Bituminous (a)—					
Continued.					
Western:	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
Iowa	3,987,253	4,156,074	3,954,028	4,611,865	4,618,842
Missouri	2,245,039	2,372,393	2,331,542	2,665,626	2,688,321
Nebraska and Idaho			b 3,560	645	c 1,039
Kansas	3,388,251	2,926,870	2,884,801	3,054,012	3,406,555
Arkansas	512,626	598,322	675,374	856,190	1,205,479
Indian Terri- tory	969,606	1,211,185	1,366,646	1,336,380	1,381,466
Texas	420,848	484,969	544,015	639,341	686,794
	11,503,623	11,749,803	11,759,966	13,164,059	13,988,436
Rocky Mountain, etc.:					
North Dakota	42,015	39,197	d 78,050	77,246	83,895
Montana	927,395	1,504,193	1,543,445	1,647,882	1,479,803
Wyoming	2,417,463	2,246,911	2,229,624	2,597,886	2,863,812
Utah	431,550	471,836	418,627	521,560	593,709
Colorado	2,776,817	3,027,327	3,054,711	3,307,644	4,053,210
New Mexico..	580,238	709,130	600,823	701,964	968,330
Nevada	150				
	7,175,628	7,998,594	7,925,280	8,854,182	10,042,759
Pacific coast:					
Washington..	1,106,470	1,191,410	1,195,504	1,434,112	1,884,571
Oregon	47,521	73,685	101,721	101,755	58,184
California....	67,247	75,453	e 93,776	e 103,912	e 160,288
	1,221,238	1,340,548	1,391,001	1,639,779	2,103,043
Total prod- uct, in- cluding colliery consump- tion.....	170,741,526	193,117,530	191,986,357	200,221,665	219,974,667

a Including lignite, brown coal, and scattering lots of anthracite.

b Nebraska only.

c Idaho only.

d Includes South Dakota.

e Includes Alaska.

PRODUCTION.

Following a year of unprecedented coal mining activity which brought the coal product of the United States for the first time past a total of 200,000,000 short tons, the year 1898 added almost 10 per cent, or another 20,000,000 tons, to the record made the year before. The actual figures of tonnage and value in 1898 were 196,405,953 long tons, or 219,974,667 short tons, worth at the mines \$208,000,850. It will be seen from this that the product in 1898 was within less than 26,000 short tons of reaching 220,000,000. As compared with 1897, the increase in output in 1898 amounted to 17,636,609 long tons, or 19,753,002 short tons, while the value increased somewhat less in proportion, or \$9,131,672. All of the increase in value and nearly all of the increase in tonnage was in the production of bituminous coal. The increase in the production of anthracite coal amounted to only 688,361 long tons, of which 470,154 tons was in the increase of colliery consumption, leaving the increase in marketed coal only 218,207 long tons. The practically stationary condition of the anthracite coal mining industry was not the only unfavorable aspect presented in the statistics for 1898. The product brought to the producers in 1898 \$3,887,417 less than the slightly smaller product in 1897.

The production of bituminous coal in 1898 was 16,948,248 long tons, or 18,982,038 short tons, larger than that of 1897, with an increase of \$13,019,089 in value, so that the value of the aggregate product showed a net increase of \$9,131,672. The increase in value of the bituminous product was, however, in less proportion than that of the product itself, the declining tendency in prices which has marked the industry for several years continuing through 1898. The inclination displayed by anthracite producers to keep the production in excess of the market requirements, notwithstanding restricting agreements, easily accounts for the decreased value of that commodity, but such was not the case in bituminous circles. For the first time in ten years the demand for bituminous coal was up to the supply, while at not infrequent times during the year operators experienced difficulty in filling their orders. In spite of this fact, however, the average price declined 1 cent per ton. This is not much in itself, but it is the sixth consecutive year in which the price has declined, and the eleventh since there has been an advance. In 1887 the general average price for bituminous coal at the mines was \$1.12. In the next two years it was \$1, and 99 cents for the next three years. It then declined steadily, first to 96 cents in 1893, 91 cents in 1894, and then to 86 cents, 83 cents, 81 cents, and finally in 1898 to 80 cents. During the ten years 1887 to 1897 the decline in price was accepted as a natural result of overproduction, from which the bituminous trade suffered in common with anthracite. But that the prices should continue to decline when the operators were put to straits to fill their orders rather than to find a market is not to be explained so

readily. The rational explanation seems to be that the economies in production forced upon the operators by the conditions of the previous ten years are shown now in the ability to increase their tonnage without a corresponding increase in expense, and the spirit of competition among the producers enables the consumer to get a part of the benefit of the decreased cost of production.

The notable increase in the use of mining machinery in 1897 and 1898 may be considered as an active agent in the cheapening of bituminous coal. The amount of coal undercut by machines in 1898 was 32,413,144 short tons, against 22,649,220 short tons in 1897 and 16,420,252 tons in 1896. These figures are considered more in detail in another portion of this report.

In considering the coal product these reports include not only the coal marketed, either by shipment to distant points or sold locally, but also that consumed by the mine employees and by the mine operators themselves in locomotives, under stationary boilers, etc., in working the mine, and technically known as colliery consumption. There are occasional exceptions, where operators use only slack or waste, which would otherwise be thrown on the dump and no record kept, the miner not even being paid for it. These exceptions are few and the amount so comparatively small as not to materially affect the total. Coal consumed in the manufacture of coke is also included in this report.

The coal shipped, sold to local trade and employees, and used in the manufacture of coke is considered the marketable product. The colliery consumption averages about 8 per cent of the total product in anthracite production and about 1½ per cent in bituminous mining. The marketable product in 1898 amounted to 212,053,378 short tons as compared with 193,280,246 short tons in 1897.

ANTHRACITE.

The production of anthracite coal in Pennsylvania in 1898 amounted to 47,663,075 long tons, or 53,382,644 short tons, valued at \$75,414,537, against 46,974,714 long tons, or 52,611,680 short tons, valued at \$79,301,954, in 1897, and 48,523,287 long tons, or 54,346,081 short tons, valued at \$81,748,651, in 1896. The output in 1898, compared with 1897, shows an increase of 688,361 long tons, or 770,964 short tons, and a decrease in value of \$3,887,417.

In making up this statement the production of the Bernice basin, in Sullivan County, is included. This product is not considered strictly anthracite by the trade, and Mr. William W. Ruley excludes it from his contribution on the production of anthracite coal in Pennsylvania. The State bureau of industrial statistics, on the other hand, includes it in the production of the third anthracite district, and analyses of the coal show it to be more closely allied, chemically, as it is geographically, to anthracite than bituminous, it having a higher percentage of fixed carbon than the coals classed as semianthracite, such as that

from Franklin County, Arkansas. The production of this region, in 1898, has accordingly been added to the anthracite product. In 1897 it was included in the bituminous output, but in carrying forward the statistics of 1897 for this report they have been changed to conform with the figures for 1898.

The statistics of anthracite production in 1898 indicate that the conditions which have adversely affected the anthracite industry for several years have not only not improved, but have, on the other hand, become more pronounced. The production has remained practically stationary for three years, the output in 1896, 1897, and 1898, averaging about 47,700,000 long tons, or approximately 4,000,000 long tons less than in 1895, when the maximum product was obtained. Anthracite operators, by harmonious action and the restriction of production in 1896 and 1897, were able to uphold prices, so that the average value per long ton at the mines for all marketable sizes was \$1.85 for both years, as against \$1.72 in 1895. The prices in 1897 and 1898 did not yield abnormal nor unreasonable profits to the producers, but they were higher than those realized in 1895, and consumers are much more unfavorably impressed by a rise in the price of their fuel than they are favorably impressed by a decline. Consequently many large users of coal for steam raising turned to bituminous coal or mixtures of bituminous and small anthracite, while housekeepers, particularly in the summer season, have been led to the increased consumption of gas or coke for cooking purposes. The anthracite interests found, therefore, that in restricting production in order to maintain prices at a profitable figure they were also restricting their markets, and giving advantages to their adversaries, the producers and carriers of bituminous coal. In the face of such conditions it was difficult to see how the prices of 1896 and 1897 could be maintained, and the statistics for 1898 show that the anthracite producers were compelled to reduce prices or see the market for their product still further curtailed. An average decline of about 10 cents per ton ruled the prices for 1898 as compared with the two preceding years, and the total value last year was \$3,872,448 less than that of the somewhat smaller product in 1897.

The statistics of labor employed in the anthracite mines show that 145,504 men worked an average of 152 days in 1898, as compared with 149,884 men for 150 days in 1897. These figures indicate that the policy of working the mines only three or four days in the week has had the effect of driving some of the anthracite miners into other fields of employment. The average tonnage per day per man in 1898 was 2.16, as compared with 2.09 in 1897 and 1.87 in 1896.

The "number of men employed" includes, besides the miners, the day laborers inside and outside the mines, teamsters, mechanics, etc. The tonnage per miner, therefore, would be considerably in excess of the figures given; but as no separation of the number of miners has been made it is not possible to ascertain their average tonnage. Taking the

total number of employees, we find that the number of tons produced for each man in 1894 was 251.5; in 1895 each man produced 362.8 tons; in 1896 the total for each man was 325.4, while in 1897, notwithstanding the larger tonnage per man per day, the total tonnage for each man employed was only 313.5. In 1898 the total amount of coal produced per man was 327.3, showing that, provided the mining rate remained constant, the total yearly earnings of each employee in 1898 were more than at any time within five years, except 1895.

In addition to the anthracite product of Pennsylvania, a small amount of coal which is true anthracite is mined in Colorado and New Mexico. The amount produced, however, is comparatively insignificant (47,095 short tons in 1898, and 69,076 tons in 1897), and has no appreciable effect upon the total. For the sake of convenience, therefore, this factor is included in the bituminous product, except in the preceding tables giving the production by fields. With this exception, reference to anthracite production throughout this and previous reports considers that of Pennsylvania only.

BITUMINOUS.

The bituminous coal product, as assembled in these reports, includes, in addition to strictly bituminous coals, cannel, splint, "block," semi-anthracite (except the Bernice basin coal in Pennsylvania), semibituminous, and lignite or brown coals and the anthracite coal of Colorado and New Mexico. The aggregate output of these in 1898 was 166,592,023 short tons, valued at \$132,586,313, against 147,609,985 short tons, valued at \$119,567,224, in 1897, and 137,640,276 short tons, worth \$114,891,515, in 1896.

The year of 1898 was one of unprecedented activity in the bituminous coal mines of the United States, and while there was a decline of 1 cent in the average price as compared with 1897, the large increase in tonnage, more than half of which was due to the increase in the product by mining machines, made the expenses of mining comparatively less, and enabled producers to stand a somewhat lower price for the product. The product in 1898 shows an increase of 18,982,038 short tons, or 12.86 per cent over that of 1897, which had the largest production up to that time. Bituminous coal producers occupied, for them, a unique position in 1898. While there were cases of comparatively poor business, the prevalent complaint was of inability on account of a scarcity of cars or of miners to keep up with the orders. In fact 1898 was the first year in ten, and perhaps more, in which the supply of bituminous coal was not in excess of the demand, and at the time of writing this report (May, 1899) the active demand prevailing in 1898 has not shown any material diminution. It would appear, therefore, that the current year will show a decided increase over the enormous product of 1898.

Production has shown an increase each year since 1889, with one exception (1894), and with three exceptions the production has increased each year since 1880. In 1880, according to the Tenth Census, the amount of bituminous coal produced in the United States was 42,831,758 short tons. In the eighteen years following that the production has increased annually (with three exceptions) until, in 1898, the output was 3.9 times that of 1880. At the time of taking the Eleventh Census (in 1889) the bituminous coal product was 95,684,543 short tons, showing that in the nine years since 1889 the product has increased nearly 74 per cent.

The value of the bituminous product has not increased in the same proportion. While the amount of coal produced in 1898 was 3.9 more than that of 1880, the value was only two and one-half times as much. The average price per ton received for the product in 1880 was \$1.25, whereas in 1898 it had fallen to 80 cents, a decline of 36 per cent. The average price per ton has not exceeded \$1 since 1887. Once before (in 1884) it had fallen below that figure, but recovered in the following year. There has been no reaction against the decline in price since 1887, and the average price per ton in 1898 was the lowest ever recorded.

Including the Territory of Alaska there were thirty States and Territories producing bituminous coal in 1898, one less than in 1897. Nebraska, which produced a small amount of coal in 1897, did not contribute any in 1898. Arkansas was added to the list of States producing a million tons or over per year. There were three States in which the product decreased and two in which with an increased output there was a decrease in value, and one (Illinois) with a decrease in product, had an increase in value. In twenty-two States out of the thirty the bituminous product in 1898 was the largest on record.

The number of men employed in the bituminous coal mines of the United States in 1898 was 255,717, who worked an average of 211 days, an increase from 247,817 men and 196 days in 1897.

The statistics of production in 1897 and 1898 are presented in the following tables:

Coal product of the United States in 1897, by States.

State.	Number of mines.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Made into coke.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
Alabama	78	4,543,597	86,790	126,187	1,137,196
Arkansas	14	827,518	11,588	18,084	.....
California	8	87,642	11,349	4,921	.....
Alaska					
Colorado	97	2,649,042	76,699	93,782	542,180
Georgia	2	120,398	1,481	5,500	68,490
Idaho	2	195	450	.....	.....
Nebraska					
Illinois	310	16,358,221	3,041,712	669,012	3,813
Indiana	115	3,630,499	393,012	111,376	16,282
Indian Territory	19	1,250,066	9,068	47,501	29,745
Iowa	162	4,001,311	516,427	71,494	22,633
Kansas	71	2,745,101	253,933	54,730	248
Kentucky	109	3,068,132	404,099	55,033	54,833
Maryland	25	4,391,703	27,762	22,663	.....
Michigan	13	188,636	24,686	10,270	.....
Missouri	105	2,384,797	239,686	41,143	.....
Montana	22	1,434,858	29,707	18,410	164,907
New Mexico	15	689,423	7,844	19,714	.....
North Carolina	1	21,280	.....	.....	.....
North Dakota	20	65,032	10,458	1,756	.....
Ohio	350	10,725,047	1,259,290	192,755	19,850
Oregon	8	85,903	15,409	443	.....
Pennsylvania	574	40,243,162	1,651,421	554,999	11,968,392
Tennessee	45	2,150,179	37,620	39,275	661,775
Texas	16	621,635	8,357	9,349	.....
Utah	11	424,770	22,667	9,198	64,925
Virginia	21	969,973	29,017	43,087	486,225
Washington	23	1,347,915	7,149	39,902	39,146
West Virginia	198	11,312,408	446,795	58,694	2,430,262
Wyoming	20	2,435,091	17,845	93,974	50,976
Total bituminous	2,454	118,792,534	8,642,321	2,413,252	17,761,878
Pennsylvania anthracite	350	46,811,092	1,272,421	4,528,167	.....
Grand total	2,804	165,603,626	9,914,742	6,941,419	17,761,878

Coal product of the United States in 1897, by States—Continued.

State.	Total product.	Total value.	Average price per ton.	Average number of days active.	Average number of employees.
	<i>Short tons.</i>				
Alabama	5,893,770	\$5,192,085	\$0.88	233	10,597
Arkansas	856,190	903,993	1.06	161	1,990
California	103,912	265,236	2.55	156	381
Alaska					
Colorado	3,361,703	3,947,186	1.17	180	5,852
Georgia	195,869	140,466	.72	304	469
Idaho	645	2,150	3.33	91	7
Nebraska					
Illinois	20,072,758	14,472,529	.72	185	33,788
Indiana	4,151,169	3,472,348	.84	170	8,886
Indian Territory	1,336,380	1,787,358	1.34	176	3,168
Iowa	4,611,865	5,219,503	1.13	201	10,703
Kansas	3,054,012	3,602,326	1.18	194	6,639
Kentucky	3,602,097	2,828,329	.79	178	7,983
Maryland	4,442,128	3,363,996	.76	262	4,719
Michigan	223,592	325,416	1.46	230	537
Missouri	2,665,626	2,887,884	1.08	191	6,414
Montana	1,647,882	2,897,408	1.76	252	2,337
New Mexico	716,981	991,611	1.38	208	1,659
North Carolina	21,280	27,000	1.34	215	51
North Dakota	77,246	83,803	1.08	168	170
Ohio	12,196,942	9,535,409	.78	148	26,410
Oregon	101,755	313,890	3.09	171	254
Pennsylvania	54,417,974	37,463,519	.69	205	77,272
Tennessee	2,888,849	2,329,534	.81	221	6,337
Texas	639,341	972,323	1.52	220	1,766
Utah	521,560	618,230	1.19	204	704
Virginia	1,528,302	1,021,918	.67	213	2,344
Washington	1,434,112	2,777,687	1.94	236	2,739
West Virginia	14,248,159	8,987,393	.63	205	20,504
Wyoming	2,597,886	3,136,694	1.21	219	3,137
Total bituminous	147,609,985	119,567,224	.81	196	247,817
Pennsylvania anthracite	52,611,680	79,301,954	1.51	150	149,884
Grand total	200,221,665	198,869,178	.99	179	397,701

Coal product of the United States in 1898, by States.

State.	Num- ber of mines.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Made into coke.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
Alabama	82	4, 926, 828	107, 576	145, 808	1, 355, 071
Arkansas	17	1, 167, 103	13, 256	25, 120	.....
California and Alaska ..	7	135, 568	19, 996	4, 724	.....
Colorado	101	3, 132, 676	130, 305	117, 820	695, 546
Georgia and North Caro- lina	3	145, 778	1, 194	6, 989	101, 721
Idaho	2	.....	1, 039	.....	.....
Illinois	329	15, 596, 888	2, 149, 808	852, 603	.....
Indiana	141	4, 398, 078	387, 790	130, 810	4, 065
Indian Territory	22	1, 310, 178	16, 632	34, 055	20, 601
Iowa	187	3, 981, 362	572, 063	65, 417	.....
Kansas	110	3, 079, 601	277, 022	49, 932	.....
Kentucky	116	3, 537, 429	253, 629	55, 206	41, 644
Maryland	31	4, 618, 990	36, 941	18, 953	.....
Michigan	17	232, 155	75, 622	7, 945	.....
Missouri	124	2, 393, 315	249, 662	45, 344	.....
Montana	36	1, 261, 814	29, 493	19, 386	169, 110
New Mexico	16	949, 903	7, 660	17, 601	17, 124
North Dakota	18	71, 223	11, 525	1, 147	.....
Ohio	431	13, 053, 427	1, 226, 184	222, 913	14, 343
Oregon	5	54, 305	3, 290	589	.....
Pennsylvania	689	48, 019, 561	1, 520, 750	732, 984	14, 891, 838
Tennessee	51	2, 199, 075	37, 971	52, 523	733, 327
Texas	16	678, 732	3, 247	4, 755	.....
Utah	20	485, 716	11, 542	9, 845	86, 606
Virginia	20	1, 029, 185	19, 564	16, 234	750, 291
Washington	23	1, 748, 411	30, 636	56, 966	48, 558
West Virginia	225	12, 965, 903	471, 796	61, 176	3, 202, 124
Wyoming	23	2, 694, 326	21, 655	108, 447	35, 384
Total bituminous ..	2, 862	133, 871, 530	7, 687, 848	2, 865, 292	22, 167, 353
Pennsylvania anthracite	340	47, 088, 581	1, 238, 066	5, 055, 997	.....
Grand total	3, 202	180, 960, 111	8, 925, 914	7, 921, 289	22, 167, 353

Coal product of the United States in 1898, by States—Continued.

State.	Total production.	Total value.	Average price per ton.	Average number of days active.	Average number of employees.
	<i>Short tons.</i>				
Alabama	6,535,283	\$4,932,776	\$0.75	250	10,733
Arkansas	1,205,479	1,238,778	1.03	163	2,555
California and Alaska ..	160,288	405,915	2.53	265	314
Colorado	4,076,347	4,698,081	1.15	220	6,440
Georgia and North Carolina	255,682	212,537	.83	292	534
Idaho	1,039	2,675	2.57	157	7
Illinois	18,599,299	14,567,598	.78	175	35,026
Indiana	4,920,743	3,994,918	.81	199	8,971
Indian Territory	1,381,466	1,827,638	1.32	198	3,216
Iowa	4,618,842	5,260,716	1.14	219	10,262
Kansas	3,406,555	3,703,014	1.09	194	7,197
Kentucky	3,887,908	3,084,551	.79	187	7,614
Maryland	4,674,884	3,532,257	.76	253	4,818
Michigan	315,722	462,711	1.47	245	715
Missouri	2,688,321	2,871,296	1.07	198	6,542
Montana	1,479,803	2,324,207	1.57	216	2,359
New Mexico	992,288	1,344,750	1.35	242	1,873
North Dakota	83,895	93,591	1.12	187	151
Ohio	14,516,867	12,027,336	.83	169	26,986
Oregon	58,184	212,184	3.65	142	199
Pennsylvania	65,165,133	43,352,588	.67	229	79,611
Tennessee	3,022,896	2,337,512	.77	234	6,643
Texas	686,734	1,139,763	1.66	245	2,130
Utah	593,709	752,252	1.27	243	739
Virginia	1,815,274	1,070,417	.59	230	1,855
Washington	1,884,571	3,352,798	1.78	270	3,145
West Virginia	16,700,999	10,131,264	.61	218	21,607
Wyoming	2,863,812	3,664,190	1.28	242	3,475
Total bituminous	166,592,023	132,586,313	.80	211	255,717
Pennsylvania anthracite	53,382,644	75,414,537	1.41	152	145,504
Grand total	219,974,667	208,000,850	.95	190	401,221

Production of coal in the United States from 1889 to 1898.

Year.	Number of mines.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Manufactured into coke.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
1889..		113, 776, 701	8, 508, 699	5, 382, 265	13, 561, 848
1890..		128, 383, 658	9, 009, 285	5, 063, 953	15, 331, 760
1891..		92, 615, 738	7, 816, 891	1, 750, 169	15, 718, 440
1892..		146, 372, 098	9, 704, 678	6, 210, 767	17, 041, 528
1893..		152, 941, 890	9, 728, 815	6, 712, 284	12, 969, 785
1894..		142, 833, 319	8, 764, 538	6, 307, 296	12, 836, 373
1895..	2, 904	158, 380, 289	9, 655, 505	6, 677, 539	18, 404, 197
1896..	2, 954	159, 176, 155	9, 502, 927	7, 184, 832	16, 122, 443
1897..	2, 804	165, 603, 626	9, 914, 742	6, 941, 419	17, 761, 878
1898..	3, 202	180, 960, 111	8, 925, 914	7, 921, 289	22, 167, 353

Year.	Total production.	Total value.	Average price per ton.	Average number of days active.	Average number of employees.
	<i>Short tons.</i>				
1889..	141, 229, 513	\$160, 226, 323	\$1. 13	-----	-----
1890..	157, 788, 656	176, 804, 573	1. 12	216	318, 204
1891..	117, 901, 238	117, 188, 400	. 994	223	205, 803
1892..	179, 329, 071	207, 566, 381	1. 16	212	341, 943
1893..	182, 352, 774	208, 438, 696	1. 14	201	363, 309
1894..	170, 741, 526	186, 141, 564	1. 09	178	376, 206
1895..	193, 117, 530	197, 799, 043	1. 02	195	382, 879
1896..	191, 936, 357	196, 640, 166	1. 02	185	386, 656
1897..	200, 221, 665	198, 869, 178	. 99	179	397, 701
1898..	219, 974, 667	208, 000, 850	. 95	190	401, 221

PRODUCTION IN PREVIOUS YEARS.

The following table shows the annual production of anthracite and bituminous coal since 1880. The quantities are expressed both in long tons of 2,240 pounds and in short tons of 2,000 pounds. It will be observed that in the nineteen years from 1880 to 1898 the output of anthracite coal has increased from 25,580,189 long tons, or 28,649,811 short tons, to 47,663,075 long tons, or 53,382,644 short tons, the production in 1898 being 86 per cent more than that of 1880. The annual production of bituminous coal has increased 289 per cent, from 42,831,758 short tons in 1880 to 166,592,023 tons in 1898. As compared with 1880, the value per ton of the anthracite product in 1898 shows a slight loss, the percentage of increase in the value being 78, against 86 per cent increase in product. The percentage of increase in the value of the bituminous product, on the other hand, was 148, or about one-half the percentage of increase in the amount.

Annual production of coal in the United States since 1880.

Year.	Bituminous coal.		
	Long tons of 2,240 pounds.	Short tons of 2,000 pounds.	Value.
1880.....	38,242,641	42,831,758	\$53,443,718
1881.....	48,365,341	53,961,012	60,224,344
1882.....	60,861,190	68,164,533	76,076,487
1883.....	68,531,500	76,755,280	82,237,800
1884.....	73,730,539	82,578,204	77,417,066
1885.....	64,840,668	72,621,548	82,347,648
1886.....	66,646,947	74,644,581	78,481,056
1887.....	79,073,227	88,562,014	98,004,656
1888.....	91,107,002	102,039,843	101,860,529
1889.....	85,432,717	95,684,643	94,504,745
1890.....	99,377,073	111,302,322	110,420,801
1891.....	105,268,962	117,901,237	117,188,400
1892.....	113,264,792	126,856,567	125,124,381
1893.....	114,629,671	128,385,231	122,751,618
1894.....	106,089,647	118,820,405	107,653,501
1895.....	120,641,244	135,118,193	115,779,771
1896.....	122,893,104	137,640,276	114,891,515
1897.....	131,794,630	147,609,985	119,567,224
1898.....	148,742,878	166,592,023	132,586,313

Year.	Pennsylvania anthracite.		
	Long tons of 2,240 pounds.	Short tons of 2,000 pounds.	Value.
1880.....	25,580,189	28,649,811	\$42,196,678
1881.....	28,500,016	31,920,018	64,125,036
1882.....	31,358,264	35,121,256	70,556,094
1883.....	34,336,469	38,456,845	77,257,055
1884.....	33,175,756	37,156,847	66,351,512
1885.....	34,228,548	38,335,974	76,671,948
1886.....	34,853,077	39,035,446	76,119,120
1887.....	37,578,747	42,088,197	84,552,181
1888.....	41,624,611	46,619,564	89,020,483
1889.....	40,665,152	45,544,970	65,721,578
1890.....	41,489,858	46,468,641	66,383,772
1891.....	45,236,992	50,665,431	73,944,735
1892.....	46,850,450	52,472,504	82,442,000
1893.....	48,185,306	53,967,543	85,687,078
1894.....	46,358,144	51,921,121	78,488,063
1895.....	51,785,122	57,999,337	82,019,272
1896.....	48,523,287	54,346,081	81,748,651
1897.....	46,974,714	52,611,680	79,301,954
1898.....	47,663,075	53,382,644	75,414,537

Annual production of coal in the United States since 1880—Continued.

Year.	Total.		
	Long tons.	Short tons.	Value.
1880.....	63,822,830	71,481,569	\$95,640,396
1881.....	76,865,357	85,881,030	124,349,380
1882.....	92,219,454	103,285,789	146,632,581
1883.....	102,867,969	115,212,125	159,494,855
1884.....	106,906,295	119,735,051	143,768,578
1885.....	99,069,216	110,957,522	159,019,596
1886.....	101,500,024	113,680,027	154,600,176
1887.....	116,651,974	130,650,211	182,498,737
1888.....	132,731,613	148,659,407	190,881,012
1889.....	126,097,869	141,229,613	160,226,323
1890.....	140,866,931	157,770,963	176,804,573
1891.....	150,505,954	168,566,668	191,133,135
1892.....	160,115,242	179,329,071	207,566,381
1893.....	162,814,977	182,352,774	208,438,696
1894.....	152,447,791	170,741,526	186,141,564
1895.....	172,426,366	193,117,530	197,799,043
1896.....	171,416,390	191,986,357	196,640,166
1897.....	178,769,344	200,221,665	198,869,178
1898.....	196,405,953	219,974,667	208,000,850

The statistics of production in the separate States for years prior to 1886 are so incomplete that a statement showing them would be largely a matter of guesswork and of no practical value. Since 1886 the statistics have been collected regularly and systematically by the Geological Survey, with the exception of 1889, when the information was gathered by the Eleventh United States Census. The total amount and value of coal produced in the United States from 1886 to 1898, inclusive, is shown in the following table. The quantities are expressed uniformly in short tons of 2,000 pounds.

COAL.

317

Amount and value of coal produced in the United States, by States and Territories, from 1886 to 1898.

State or Territory.	1886.		1887.	
	Product.	Value.	Product.	Value.
	<i>Short tons.</i>		<i>Short tons.</i>	
Alabama	1,800,000	\$2,574,000	1,950,000	\$2,535,000
Arkansas	125,000	200,000	129,600	194,400
California	100,000	300,000	50,000	150,000
Colorado	1,368,338	3,215,594	1,791,735	3,941,817
Georgia	223,000	334,500	313,715	470,573
Idaho	1,500	6,000	500	2,000
Illinois	9,246,435	10,263,543	10,278,890	11,152,596
Indiana	3,000,000	3,450,000	3,217,711	4,324,604
Indian Territory	534,580	855,328	685,911	1,286,692
Iowa	4,315,779	5,391,151	4,473,828	5,991,735
Kansas	1,400,000	1,680,000	1,598,879	2,235,631
Kentucky	1,550,000	1,782,500	1,933,185	2,223,163
Maryland	2,517,577	2,391,698	3,278,023	3,114,122
Michigan	60,434	90,651	71,461	107,191
Missouri	1,800,000	2,340,000	3,209,916	4,298,994
Montana	49,846	174,460	10,202	35,707
Nebraska			1,500	3,000
New Mexico	271,285	813,855	508,034	1,524,102
North Dakota	25,955	41,277	21,470	32,205
Ohio	8,435,211	8,013,450	10,301,708	9,096,848
Oregon	45,000	112,500	31,696	70,000
Pennsylvania:				
Anthracite	36,696,475	71,558,126	39,506,255	79,365,244
Bituminous	27,094,501	21,016,235	31,516,856	27,806,941
Rhode Island			6,000	16,250
Tennessee	1,714,290	1,971,434	1,900,000	2,470,000
Texas	100,000	185,000	75,000	150,000
Utah	200,000	420,000	180,021	360,042
Virginia	684,951	684,951	825,263	773,360
Washington	423,525	952,931	772,612	1,699,746
West Virginia	4,005,796	3,805,506	4,881,620	4,594,979
Wyoming	829,355	2,488,065	1,170,318	3,510,954
Total product sold.	108,618,833	147,112,755	124,689,909	173,537,896
Colliery consumption.	5,061,194	.....	5,960,302	8,960,841
Total	113,680,027	147,112,755	130,650,211	182,498,737

Amount and value of coal produced in the United States, etc.—Continued.

State or Territory.	1888.		1889.	
	Product.	Value.	Product.	Value.
	<i>Short tons.</i>		<i>Short tons.</i>	
Alabama	2,900,000	\$3,335,000	3,572,983	\$3,961,491
Arkansas	276,871	415,306	279,584	395,836
California	95,000	380,000	184,179	434,382
Colorado	2,185,477	4,808,049	2,544,144	3,843,992
Georgia	180,000	270,000	226,156	339,382
Idaho	400	1,800	.....	.....
Illinois	14,655,188	16,413,811	12,104,272	11,755,203
Indiana	3,140,979	4,397,370	2,845,057	2,887,852
Indian Territory	761,986	1,432,072	752,832	1,323,807
Iowa	4,952,440	6,438,172	4,095,358	5,426,509
Kansas	1,850,000	2,775,000	2,221,043	3,297,288
Kentucky	2,570,000	3,084,000	2,399,755	2,374,339
Maryland	3,479,470	3,293,070	2,939,715	2,517,474
Michigan	81,407	135,221	67,431	115,011
Missouri	3,909,967	8,650,800	2,557,823	3,479,057
Montana	41,467	145,135	363,301	880,773
Nebraska	1,500	3,375	1,500	4,500
New Mexico	626,665	1,879,995	486,463	870,468
North Carolina .....	.....	.....	(a)	.....
North Dakota	34,000	119,000	28,907	41,431
Ohio	10,910,951	10,147,180	9,976,787	9,355,400
Oregon	75,000	225,000	(b)	.....
Pennsylvania:				
Anthracite	43,922,897	85,649,649	c 45,598,487	65,873,514
Bituminous	33,796,727	32,106,891	36,174,089	27,953,315
Rhode Island	4,000	11,000	2,000	6,000
Tennessee	1,967,297	2,164,026	1,925,689	2,338,309
Texas	90,000	184,500	128,216	340,620
Utah	258,961	543,818	236,651	377,456
Virginia	1,073,000	1,073,000	865,786	804,475
Washington	1,215,750	3,647,250	1,030,578	2,393,238
West Virginia	5,498,800	6,048,680	6,231,880	5,086,584
Wyoming	1,481,540	4,444,620	1,388,947	1,748,617 ^c
Total product sold.	142,037,740	204,222,790	141,229,613	160,226,323
Colliery consumption.	6,621,667	7,295,834	.....	.....
Total	148,659,407	211,518,624	141,229,613	160,226,323

^a Product included in Georgia.

^b Product included in California.

^c Includes product of anthracite in Colorado and New Mexico.

Amount and value of coal produced in the United States, etc.—Continued.

State or Territory.	1890.		1891.	
	Product.	Value.	Product.	Value.
	<i>Short tons.</i>		<i>Short tons.</i>	
Alabama	4, 090, 409	\$4, 202, 469	4, 759, 781	\$5, 087, 596
Arkansas	399, 888	514, 595	542, 379	647, 560
California	110, 711	283, 019	93, 301	204, 902
Colorado	3, 094, 003	4, 344, 196	3, 512, 632	4, 800, 000
Georgia	228, 337	238, 315	171, 000	256, 500
Illinois	15, 274, 727	14, 171, 230	15, 680, 698	14, 237, 074
Indiana	3, 305, 737	3, 259, 233	2, 973, 474	3, 070, 918
Indian Territory	869, 229	1, 579, 188	1, 091, 032	1, 897, 037
Iowa	4, 021, 739	4, 995, 739	3, 825, 495	4, 807, 999
Kansas	2, 259, 922	2, 947, 517	2, 716, 705	3, 557, 303
Kentucky	2, 701, 496	2, 472, 119	2, 916, 069	2, 715, 600
Maryland	3, 357, 813	2, 899, 572	3, 820, 239	3, 082, 515
Michigan	74, 977	149, 195	80, 307	133, 387
Missouri	2, 735, 221	3, 382, 858	2, 674, 606	3, 283, 242
Montana	517, 477	1, 252, 492	541, 861	1, 228, 630
Nebraska	1, 500	4, 500	1, 500	4, 500
New Mexico	375, 777	504, 390	462, 328	779, 018
North Carolina	10, 262	17, 864	20, 355	39, 365
North Dakota	30, 000	42, 000	30, 000	42, 000
Ohio	11, 494, 506	10, 783, 171	12, 868, 683	12, 106, 115
Oregon	61, 514	177, 875	51, 826	155, 478
Pennsylvania:				
Anthracite	46, 468, 641	66, 383, 772	50, 665, 431	73, 944, 735
Bituminous	42, 302, 173	35, 376, 916	42, 788, 490	37, 271, 053
Rhode Island			500	10, 000
Tennessee	2, 169, 585	2, 395, 746	2, 413, 678	2, 668, 188
Texas	184, 440	465, 900	172, 100	412, 360
Utah	318, 159	552, 390	371, 045	666, 045
Virginia	784, 011	589, 925	736, 399	611, 654
Washington	1, 263, 689	3, 426, 590	1, 056, 249	2, 437, 270
West Virginia	7, 394, 654	6, 208, 128	9, 220, 665	7, 359, 816
Wyoming	1, 870, 366	3, 183, 669	2, 327, 841	3, 555, 275
Total	157, 770, 963	176, 804, 573	168, 566, 669	191, 133, 135

MINERAL RESOURCES.

Amount and value of coal produced in the United States, etc.—Continued.

State or Territory.	1892.		1893.	
	Product.	Value.	Product.	Value.
	<i>Short tons.</i>		<i>Short tons.</i>	
Alabama	5, 529, 312	\$5, 788, 898	5, 136, 935	\$5, 096, 792
Arkansas	535, 558	666, 230	574, 763	773, 347
California	85, 178	209, 711	72, 603	167, 555
Colorado	3, 510, 830	5, 685, 112	4, 102, 389	5, 104, 602
Georgia	215, 498	212, 761	372, 740	365, 972
Illinois	17, 862, 276	16, 243, 645	19, 949, 564	17, 827, 595
Indiana	3, 345, 174	3, 620, 582	3, 791, 851	4, 055, 372
Indian Territory	1, 192, 721	2, 043, 479	1, 252, 110	2, 235, 209
Iowa	3, 918, 491	5, 175, 060	3, 972, 229	5, 110, 460
Kansas	3, 007, 276	3, 955, 595	2, 652, 546	3, 375, 740
Kentucky	3, 025, 313	2, 771, 238	3, 007, 179	2, 613, 569
Maryland	3, 419, 962	3, 063, 580	3, 716, 041	3, 267, 317
Michigan	77, 990	121, 314	45, 979	82, 462
Missouri	2, 733, 949	3, 369, 659	2, 897, 442	3, 562, 757
Montana	564, 648	1, 330, 847	892, 309	1, 772, 116
Nebraska	1, 500	4, 500		
New Mexico	661, 330	1, 074, 601	665, 094	979, 044
North Carolina	6, 679	9, 599	17, 000	25, 500
North Dakota	40, 725	39, 250	49, 630	56, 250
Ohio	13, 562, 927	12, 722, 745	13, 253, 646	12, 351, 139
Oregon	34, 661	148, 546	41, 683	164, 500
Pennsylvania:				
Anthracite	52, 472, 504	82, 442, 000	53, 967, 543	85, 687, 078.
Bituminous	46, 694, 576	39, 017, 164	44, 070, 724	35, 260, 674
Tennessee	2, 092, 064	2, 355, 441	1, 902, 258	2, 048, 449
Texas	245, 690	569, 333	302, 206	688, 407
Utah	361, 013	562, 625	413, 205	611, 092
Virginia	675, 205	578, 429	820, 339	692, 748
Washington	1, 213, 427	2, 763, 547	1, 264, 877	2, 920, 876
West Virginia	9, 738, 755	7, 852, 114	10, 708, 578	8, 251, 170
Wyoming	2, 503, 839	3, 168, 776	2, 439, 311	3, 290, 904
Total product ..	179, 329, 071	207, 566, 381	182, 352, 774	208, 438, 696

Amount and value of coal produced in the United States, etc.—Continued.

State or Territory.	1894.		1895.	
	Product.	Value.	Product.	Value.
	<i>Short tons.</i>		<i>Short tons.</i>	
Alabama	4,397,178	\$4,065,535	5,693,775	\$5,126,822
Arkansas	512,626	631,988	598,322	751,156
California	67,247	155,620	75,453	175,778
Colorado	2,831,409	3,516,340	3,082,982	3,675,185
Georgia	354,111	299,290	260,998	215,863
Illinois	17,113,576	15,282,111	17,735,864	14,239,157
Indiana	3,423,921	3,295,034	3,995,892	3,642,623
Indian Territory	969,606	1,541,293	1,211,185	1,737,254
Iowa	3,967,253	4,987,939	4,156,074	4,982,102
Kansas	3,388,251	4,178,998	2,926,870	3,481,981
Kentucky	3,111,192	2,749,932	3,357,770	2,890,247
Maryland	3,501,428	2,687,270	3,915,585	3,160,592
Michigan	70,022	103,049	112,322	180,016
Missouri	2,245,039	3,634,564	2,372,393	2,651,612
Montana	927,395	1,887,390	1,504,193	2,850,906
Nevada	150	475		
New Mexico	597,196	935,857	720,654	1,072,520
North Carolina	16,900	29,675	24,900	41,350
North Dakota	42,015	47,049	^a 39,197	^a 42,046
Ohio	11,909,856	9,841,723	13,355,806	10,618,477
Oregon	47,521	183,914	73,685	247,901
Pennsylvania:				
Anthracite	51,921,121	78,488,063	57,999,337	82,019,272
Bituminous	39,912,463	29,479,820	50,217,228	35,980,357
Tennessee	2,180,879	2,119,481	2,535,644	2,349,032
Texas	420,848	976,458	484,959	913,138
Utah	431,550	603,479	471,836	617,349
Virginia	1,229,083	933,576	1,368,324	869,873
Washington	1,106,470	2,578,441	1,191,410	2,577,958
West Virginia	11,627,757	8,706,808	11,387,961	7,710,575
Wyoming	2,417,463	3,170,392	2,246,911	2,977,901
Total product ..	170,741,526	186,141,564	193,117,530	197,799,043

^a Includes South Dakota.

Amount and value of coal produced in the United States, etc.—Continued.

State or Territory.	1896.		1897.	
	Product.	Value.	Product.	Value.
	<i>Short tons.</i>		<i>Short tons.</i>	
Alabama	5,748,697	\$5,174,135	5,893,770	\$5,192,085
Arkansas	675,374	755,577	856,190	903,993
California	<i>a</i> 93,776	220,523	<i>a</i> 103,912	265,236
Colorado	3,112,400	3,606,642	3,361,703	3,947,186
Georgia	<i>b</i> 246,359	179,770	<i>b</i> 217,149	167,466
Idaho			645	2,150
Illinois	19,786,626	15,809,736	20,072,758	14,472,529
Indiana	3,905,779	3,261,737	4,151,169	3,472,348
Indian Territory	1,366,646	1,918,115	1,336,380	1,787,358
Iowa	3,951,028	4,628,022	4,611,865	5,219,503
Kansas	2,884,801	3,295,032	3,054,012	3,602,326
Kentucky	3,333,478	2,684,306	3,602,097	2,828,329
Maryland	4,143,936	3,299,928	4,442,128	3,363,996
Michigan	92,882	150,631	223,592	325,416
Missouri	2,331,542	2,518,194	2,665,626	2,887,884
Montana	1,543,445	2,279,672	1,647,882	2,897,408
Nebraska	(<i>c</i>)	(<i>c</i>)	(<i>f</i>)	(<i>f</i>)
New Mexico	622,626	930,381	716,981	991,611
North Carolina	(<i>d</i>)	(<i>d</i>)	(<i>d</i>)	(<i>d</i>)
North Dakota	78,050	84,908	77,246	83,803
Ohio	12,875,202	10,253,461	12,196,942	9,535,409
Oregon	101,721	294,564	101,755	313,890
Pennsylvania:				
Anthracite	54,346,081	81,748,651	52,611,680	79,301,954
Bituminous	49,557,453	35,368,249	54,417,974	37,463,519
Tennessee	2,663,106	2,281,295	2,888,849	2,329,534
Texas	544,015	896,251	639,341	972,323
Utah	418,627	500,547	521,560	618,230
Virginia	1,254,723	848,851	1,528,302	1,021,918
Washington	1,195,504	2,396,078	1,434,112	2,777,687
West Virginia	12,876,296	8,336,685	14,248,159	8,987,393
Wyoming	<i>e</i> 2,233,184	2,918,225	2,597,886	3,136,694
Total product ..	191,986,357	196,640,166	200,221,665	198,869,178

a Includes Alaska.*b* Includes North Carolina.*c* Included in Wyoming.*d* Included in Georgia.*e* Includes Nebraska.*f* Included in Idaho.

Amount and value of coal produced in the United States, etc.—Continued.

State or Territory.	1898.		Increase, 1898.	
	Product.	Value.	Product.	Value.
	<i>Short tons.</i>		<i>Short tons.</i>	
Alabama	6,535,283	\$4,932,776	641,513	d \$259,309
Arkansas	1,205,479	1,238,778	349,289	334,785
California	a 160,288	405,915	56,376	140,679
Colorado	4,076,347	4,686,081	714,644	738,895
Georgia	b 255,682	212,537	38,533	45,071
Idaho	1,039	2,675	394	525
Illinois	18,599,299	14,567,598	d 1,473,459	95,069
Indiana	4,920,743	3,994,918	769,574	522,570
Indian Territory	1,381,466	1,827,638	45,086	40,280
Iowa	4,618,842	5,260,716	6,977	41,213
Kansas	3,406,555	3,703,014	352,543	100,688
Kentucky	3,887,908	3,084,551	285,811	256,222
Maryland	4,674,884	3,532,257	232,756	168,261
Michigan	315,722	462,711	92,130	137,295
Missouri	2,688,321	2,871,296	22,695	d 16,588
Montana	1,479,803	2,324,207	d 168,079	d 573,201
New Mexico	992,288	1,344,750	275,307	353,139
North Carolina	(c)	(c)		
North Dakota	83,895	93,591	6,649	9,788
Ohio	14,516,867	12,027,336	2,319,925	2,491,927
Oregon	58,184	212,184	d 43,571	d 101,706
Pennsylvania:				
Anthracite	53,382,644	75,414,537	770,964	d 3,887,417
Bituminous	65,165,133	43,352,588	10,747,159	5,889,069
Tennessee	3,022,896	2,337,512	134,047	7,978
Texas	686,734	1,139,763	47,393	167,440
Utah	593,709	752,252	72,149	134,022
Virginia	1,815,274	1,070,417	286,972	48,499
Washington	1,884,571	3,352,798	450,459	575,111
West Virginia	16,700,999	10,131,264	2,452,840	1,143,871
Wyoming	2,863,812	3,664,190	265,926	527,496
Total product ..	219,974,667	208,000,850	a 19,753,002	9,131,672

a Includes Alaska.

b Includes North Carolina.

c Net increase.

e Included in Georgia.

d Decrease.

MINERAL RESOURCES.

LABOR STATISTICS.

The following table shows under one head the total number of employees in the coal mines of the United States for a period of nine years, and the average time made by each:

Statistics of labor employed in coal mines of the United States since 1890.

State or Territory.	1890.		1891.		1892.	
	Number of days active.	Average number employed.	Number of days active.	Average number employed.	Number of days active.	Average number employed.
Alabama	217	10,642	268	9,302	271	10,075
Arkansas	214	938	214	1,317	199	1,128
California	301	364	222	256	204	187
Colorado	220	5,827	.....	6,000	229	5,747
Georgia	313	425	312	850	277	467
Illinois	204	28,574	215½	32,951	219½	34,585
Indiana	220	5,489	190	5,879	224	6,436
Indian Territory	238	2,571	221½	2,891	311	3,257
Iowa	213	8,130	224	8,124	236	8,170
Kansas	210	4,523	222	6,201	208½	6,559
Kentucky	219	5,259	225	6,355	217	6,724
Maryland	244	3,842	244	3,891	225	3,886
Michigan	229	180	205	223	195	230
Missouri	229	5,971	218	6,199	230	5,893
Montana	218	1,251	.....	1,119	258	1,158
Nevada .....	.....	.....	.....	.....	.....	.....
New Mexico	192	827	265	806	223	1,083
North Carolina	200	80	254	80	160	90
North Dakota .....	.....	.....	.....	.....	216	54
Ohio	201	20,576	206	22,182	212	22,576
Oregon	305	208	125	100	120	90
Pennsylvania bituminous	232	61,333	223	63,661	223	66,655
Tennessee	263	5,082	230	5,097	240	4,926
Texas	241	674	225	787	208	871
Utah	289	429	.....	621	230	646
Virginia	296	1,295	246	820	192	836
Washington	270	2,206	211	2,447	247	2,564
West Virginia	227	12,236	237	14,227	228	14,867
Wyoming	246	3,272	.....	3,411	225	3,133
Total	226	192,204	a 223	205,803	219	212,893
Pennsylvania anthracite	200	126,000	203	126,350	198	129,050
Grand total	216	318,204	215	332,153	212	341,943

a General average obtained from the average days made in the different States, exclusive of Colorado, Montana, Utah, and Wyoming.

Statistics of labor employed in coal mines of the United States since 1890—Continued.

State or Territory.	1893.		1894.		1895.	
	Num- ber of days active.	Average number em- ployed.	Num- ber of days active.	Average number em- ployed.	Num- ber of days active.	Average number em- ployed.
Alabama	237	11,294	238	10,859	244	10,346
Arkansas	151	1,559	134	1,493	176	1,218
California	208	158	232	126	262	190
Colorado	188	7,202	155	6,507	182	6,125
Georgia	342	736	304	729	312	848
Illinois	229	35,390	183	38,477	182	38,630
Indiana	201	7,644	149	8,603	189	8,530
Indian Territory	171	3,446	157	3,101	164	3,212
Iowa	204	8,863	170	9,995	189	10,066
Kansas	147	7,310	164	7,339	159	7,482
Kentucky	202	6,581	145	8,083	146	7,865
Maryland	240	3,935	215	3,974	248	3,912
Michigan	154	162	224	223	186	320
Missouri	206	7,375	138	7,523	163	6,299
Montana	242	1,401	192	1,782	223	2,184
Nevada			60	2		
New Mexico	229	1,011	182	965	190	1,383
North Carolina	80	70	145	95	226	61
North Dakota	193	88	156	77	139	65
Ohio	188	23,931	136	27,105	176	24,644
Oregon	192	110	243	88	69	414
Pennsylvania bituminous	190	71,931	165	75,010	206	71,130
Tennessee	232	4,976	210	5,542	224	5,120
Texas	251	996	283	1,062	171	1,642
Utah	226	576	199	671	203	670
Virginia	253	961	234	1,635	225	2,158
Washington	241	2,757	207	2,662	224	2,840
West Virginia	219	16,524	186	17,824	195	19,159
Wyoming	189	3,378	190	3,032	184	3,449
Total	204	230,365	171	244,603	194	239,962
Pennsylvania anthracite	197	132,944	190	131,603	196	142,917
Grand total	201	363,309	178	376,206	195	382,879

Statistics of labor employed in coal mines of the United States since 1890—Continued.

State or Territory.	1896.		1897.		1898.	
	Num- ber of days active.	Average number em- ployed.	Num- ber of days active.	Average number em- ployed.	Num- ber of days active.	Average number em- ployed.
Alabama	248	9,894	233	10,597	250	10,733
Arkansas	168	1,507	161	1,990	163	2,555
California	^a 291	177	^a 156	381	265	284
Colorado	172	6,704	180	5,852	220	6,440
Georgia	^b 301	731	^b 296	520	^b 292	534
Idaho			^c 91	7	157	7
Illinois	184	39,560	185	33,788	175	35,026
Indiana	163	8,806	176	8,886	199	8,971
Indian Territory	170	3,549	176	3,168	198	3,216
Iowa	178	9,672	201	10,703	219	10,262
Kansas	168	7,127	194	6,639	194	7,197
Kentucky	165	7,549	178	7,983	187	7,614
Maryland	204	4,039	262	4,719	253	4,818
Michigan	157	320	230	537	245	715
Missouri	168	5,982	191	6,414	198	6,542
Montana	234	2,335	252	2,337	216	2,359
Nevada						
New Mexico	172	1,569	208	1,659	242	1,873
North Carolina						
North Dakota	166	141	168	170	187	151
Ohio	161	25,500	148	26,410	169	26,986
Oregon	191	254	171	254	142	199
Pennsylvania bituminous	206	72,625	205	77,272	229	79,611
Tennessee	211	6,531	221	6,337	234	6,643
Texas	187	1,953	220	1,766	245	2,130
Utah	202	679	204	704	243	739
Virginia	198	2,510	213	2,344	230	1,855
Washington	221	2,622	236	2,739	270	3,145
West Virginia	201	19,078	205	20,504	218	21,607
Wyoming	^c 210	2,937	219	3,137	242	3,475
Total	192	244,171	196	247,817	211	255,717
Pennsylvania anthracite	174	148,991	150	149,884	152	145,504
Grand total	185	393,162	179	397,701	190	401,221

^a Includes Alaska.^b Includes North Carolina.^c Includes Nebraska.

PRICES.

The following table will be of interest as showing the fluctuations in the average prices ruling in each State since 1886. Prior to that year the statistics were not collected with sufficient accuracy to make a statement of the average prices of any practical value. These averages are obtained by dividing the total value by the total product, except for the years 1886, 1887, and 1888, when the item of colliery consumption was not considered.

Average prices for coal at the mines since 1886.

State or Territory.	1886.	1887.	1888.	1889.	1890.	1891.
Alabama	\$1.43	\$1.30	\$1.15	\$1.11	\$1.03	\$1.07
Arkansas	1.60	1.63	1.50	1.42	1.29	1.19
California	3.00	3.00	4.00	2.36	2.56	2.20
Colorado	2.35	2.20	2.20	1.51	1.40	1.37
Georgia	1.50	1.50	1.50	1.50	1.04	1.50
Illinois	1.11	1.09	1.12	.97	.93	.91
Indiana	1.15	1.34	1.40	1.02	.99	1.03
Indian Territory	1.60	1.87	1.88	1.76	1.82	1.74
Iowa	1.25	1.34	1.30	1.33	1.24	1.27
Kansas	1.20	1.40	1.50	1.48	1.30	1.31
Kentucky	1.15	1.15	1.20	.99	.92	.93
Maryland .....	.95	.95	.95	.86	.86	.81
Michigan	1.50	1.50	1.66	1.71	1.99	1.66
Missouri	1.30	1.34	2.21	1.36	1.24	1.23
Montana	3.50	3.50	3.50	2.42	2.42	2.27
Nevada						
New Mexico	3.00	3.00	3.00	1.79	1.34	1.68
North Carolina					1.74	1.93
North Dakota	1.59	1.50	3.50	1.43	1.40	1.40
Ohio .....	.95	.88	.93	.93	.94	.94
Oregon	2.50	2.20	3.00		2.89	3.00
Pennsylvania bituminous .....	.80	.90	.95	.77	.84	.87
Tennessee	1.15	1.30	1.10	1.21	1.10	1.11
Texas	1.85	2.00	2.05	2.66	2.53	2.40
Utah	2.10	2.00	2.10	1.59	1.74	1.80
Virginia	1.00	.94	1.00	.93	.75	.83
Washington	2.25	2.20	3.00	2.32	2.71	2.31
West Virginia .....	.94	.95	1.10	.82	.84	.80
Wyoming	3.00	3.00	3.00	1.26	1.70	1.53
Total bituminous ..	a 1.06	a 1.12	a 1.00	1.00	.99	.99
Pennsylvania anthracite ..	a 1.95	a 2.01	a 1.95	1.44	1.43	1.46
General average ...	a 1.30	a 1.45	a 1.42	1.13	1.12	1.13

a Exclusive of colliery consumption.

MINERAL RESOURCES.

Average prices for coal at the mines since 1886—Continued.

State or Territory.	1892.	1893.	1894.	1895.	1896.	1897.	1898.
Alabama	\$1.05	\$0.99	\$0.93	\$0.90	\$0.90	\$0.88	\$0.75
Arkansas	1.24	1.34	1.22	1.25	1.11	1.06	1.03
California	2.46	2.31	2.31	2.33	^a 2.35	^a 2.55	^a 2.53
Colorado	1.62	1.24	1.24	1.20	1.16	1.17	1.15
Georgia .....	.99	.98	.85	.83	.70	.72	.81
Idaho						^b 3.33	2.57
Illinois .....	.91	.89	.89	.80	.80	.72	.78
Indiana	1.08	1.07	.96	.91	.84	.84	.81
Indian Territory	1.71	1.79	1.59	1.43	1.40	1.34	1.32
Iowa	1.32	1.30	1.26	1.20	1.17	1.13	1.14
Kansas	1.31 ¹	1.27	1.23	1.20	1.15	1.18	1.09
Kentucky .....	.92	.86	.88	.86	.78	.79	.79
Maryland .....	.89	.88	.77	.81	.80	.76	.76
Michigan	1.56	1.79	1.47	1.60	1.62	1.46	1.47
Missouri	1.23	1.23	1.17	1.12	1.08	1.08	1.07
Montana	2.36	1.99	2.04	1.89	1.47	1.76	1.57
Nevada			3.15				
New Mexico	1.62	1.47	1.57	1.49	1.49	1.38	1.35
North Carolina	1.44	1.50	1.76	1.66	1.50	1.34	1.25
North Dakota .....	.96	1.13	1.12	1.07	1.09	1.08	1.11
Ohio .....	.94	.92	.83	.79	.79	.78	.83
Oregon	4.29	3.57	3.87	3.36	2.90	3.09	3.65
Pennsylvania bituminous .....	.84	.80	.74	.72	.71	.69	.67
Tennessee	1.13	1.08	.97	.93	.86	.81	.77
Texas	2.32	2.28	2.32	1.88	1.65	1.52	1.66
Utah	1.56	1.48	1.40	1.31	1.20	1.19	1.27
Virginia .....	.86	.84	.76	.63	.68	.67	.59
Washington	2.28	2.31	2.33	2.16	2.00	1.94	1.78
West Virginia .....	.80	.77	.75	.68	.65	.63	.61
Wyoming	1.27	1.35	1.31	1.33	^b 1.37	1.21	1.28
Total bituminous ..	.99	.96	.91	.86	.83	.81	.80
Pennsylvania anthracite ..	1.57	1.59	1.52	1.41	1.50	1.51	1.41
General average ...	1.16	1.14	1.09	1.02	1.02	.99	.95

^a Includes Alaska.^b Includes Nebraska.

IMPORTS AND EXPORTS.

The following tables have been compiled from official returns to the Bureau of Statistics of the Treasury Department, and show the imports and exports of coal from 1867 to 1898, inclusive. The values given in both cases are considerably higher than the average "spot" rates by which the values of the domestic production have been computed.

The tariff from 1824 to 1843 was 6 cents per bushel, or \$1.68 per long ton; from 1843 to 1846, \$1.75 per ton; 1846 to 1857, 30 per cent ad valorem; 1857 to 1861, 24 per cent ad valorem; 1861, bituminous and shale, \$1 per ton; all other, 50 cents per ton; 1862 to 1864, bituminous and shale, \$1.10 per ton; all other, 60 cents per ton; 1864 to 1872, bituminous and shale, \$1.25 per ton; all other, 40 cents per ton. By the act of 1872 the tariff on bituminous coal and shale was made 75 cents per ton, and so continued until the act of August, 1894, changed it to 40 cents per ton. On slack or culm the tariff was made 40 cents per ton by the act of 1872; was changed to 30 cents per ton by the act of March, 1883, and so continued until the act of August, 1894, changed it to 15 cents per ton. The tariff act of 1897 provides that all coals containing less than 92 per cent fixed carbon, and which will pass over a half-inch screen, shall pay a duty of 67 cents per ton. Slack or culm was not changed by the act of 1897. Tons are all 2,240 pounds. Anthracite coal has been free of duty since 1870. During the period from June, 1854, to March, 1866, the reciprocity treaty was in force, and coal from the British possessions in North America was admitted into the United States duty free.

The exports consist both of anthracite and bituminous coal, the amount of bituminous being the greater in the last few years. They are made principally by rail over the international bridges and by lake and sea to the Canadian provinces. Exports are also made by sea to the West Indies, to Central and South America, and elsewhere.

The imports are principally from Australia and British Columbia to San Francisco, from Great Britain to the Atlantic and Pacific coasts, and from Nova Scotia to Atlantic coast points.

Coal imported and entered for consumption in the United States, 1867 to 1898.

Year ending—	Anthracite.		Bituminous and shale.	
	Quantity.	Value.	Quantity.	Value.
	<i>Long tons.</i>		<i>Long tons.</i>	
June 30, 1867.....			509,802	\$1,412,597
1868.....			394,021	1,250,513
1869.....			437,228	1,222,119
1870.....			415,729	1,103,965
1871.....	973	\$4,177	430,508	1,121,914
1872.....	390	1,322	485,063	1,279,686
1873.....	2,221	10,764	460,028	1,548,208
1874.....	471	3,224	492,063	1,937,274
1875.....	138	963	436,714	1,791,601
1876.....	1,428	8,560	400,632	1,592,846
1877.....	630	2,220	495,816	1,782,941
1878.....	158	518	572,846	1,929,660
1879.....	488	721	486,501	1,716,209
1880.....	8	40	471,818	1,588,312
1881.....	1,207	2,628	652,963	1,988,199
1882.....	36	148	795,722	2,141,373
1883.....	507	1,172	645,924	3,013,555
1884.....	1,448	4,404	748,995	2,494,228
1885.....	4,976	15,848	768,477	2,548,432
Dec. 31, 1886.....	2,039	4,920	811,657	2,501,153
1887.....	14,181	42,983	819,242	2,609,311
1888.....	24,093	68,710	1,085,647	3,728,060
1889.....	20,652	117,434	1,001,374	3,425,347
1890.....	15,145	46,695	819,971	2,822,216
1891.....	37,607	112,722	1,363,313	4,561,105
1892.....	65,058	197,583	1,143,304	3,744,862
1893.....	53,768	148,112	a 1,082,993	3,623,892
1894.....	90,068	234,024	b 1,242,714	3,785,513
1895.....	141,337	328,705	c 1,212,023	3,626,623
1896.....	101,689	237,717	1,211,448	3,453,742
1897.....	24,534	59,222	d 1,276,135	3,424,833
1898.....	3,149	8,609	e 1,277,070	3,569,743

a Including 14,632 tons of slack or culm, valued at \$16,906.

b Including 30,453 tons of slack or culm, valued at \$32,267.

c Including 18,174 tons of slack or culm, valued at \$15,309.

d Including 42,954 tons of slack or culm, valued at \$44,962.

e Including 104,555 tons of slack or culm, valued at \$110,545.

Coal of domestic production exported from the United States, 1867 to 1898.

Year ending—	Anthracite.		Bituminous and shale.	
	Quantity.	Value.	Quantity.	Value.
	<i>Long tons.</i>		<i>Long tons.</i>	
June 30, 1867.....	192,912	\$1,333,457	92,189	\$512,742
1868.....	192,291	1,082,745	86,367	433,475
1869.....	283,783	1,553,115		
1870.....	121,098	803,135	106,820	503,223
1871.....	134,571	805,169	133,380	564,067
1872.....	259,567	1,375,342	141,311	586,264
1873.....	342,180	1,827,822	242,453	1,086,253
1874.....	401,912	2,236,084	361,490	1,587,666
1875.....	316,157	1,791,626	203,189	828,943
1876.....	337,934	1,869,434	230,144	850,711
1877.....	418,791	1,891,351	321,665	1,024,711
1878.....	319,477	1,006,843	340,661	1,352,624
1879.....	386,916	1,427,886	276,000	891,512
1880.....	392,626	1,362,901	222,634	695,179
1881.....	462,208	2,091,928	191,038	739,532
1882.....	553,742	2,589,887	314,320	1,102,898
1883.....	557,813	2,648,033	463,051	1,593,214
1884.....	649,040	3,053,550	646,265	1,977,959
1885.....	588,461	2,586,421	683,481	1,989,541
Dec. 31, 1886.....	667,076	2,718,143	544,768	1,440,631
1887.....	825,486	3,469,166	706,364	2,001,966
1888.....	969,542	4,325,126	860,462	2,529,472
1889.....	857,632	3,636,347	935,151	2,783,592
1890.....	794,335	3,272,697	1,280,930	4,004,995
1891.....	861,251	3,577,610	1,615,869	5,104,850
1892.....	851,639	3,722,903	1,645,869	4,999,289
1893.....	1,333,287	6,241,007	2,324,591	6,009,801
1894.....	1,440,625	6,359,021	2,195,716	4,970,270
1895.....	1,470,710	5,937,130	2,211,983	4,816,847
1896.....	1,350,000	5,925,506	2,276,202	5,072,818
1897.....	1,298,768	5,836,730	2,399,263	5,326,761
1898.....	1,350,948	5,712,985	3,152,459	6,699,248

WORLD'S PRODUCT OF COAL.

In the following table is given the coal product of the principal countries for the years nearest the one under review for which figures could be obtained. For the sake of convenience the amounts are expressed in the unit of measurement adopted in each country and reduced for comparison to short tons of 2,000 pounds. In each case the year is named for which the product is given.

The world's production of coal.

Country.	Usual unit in producing country.	Equivalent in short tons.
Great Britain (1898) .....long tons..	202,054,516	226,301,058
United States (1898).....do.....	196,405,953	219,974,667
Germany (1898).....metric tons..	130,928,490	144,283,196
France (1898).....do.....	32,439,786	35,748,644
Austria-Hungary (1897).....do.....	35,858,000	39,515,516
Belgium (1898).....do.....	22,075,093	24,326,752
Russia (1897).....do.....	11,207,475	12,350,638
Canada (1898).....short tons..	4,172,655	4,172,655
Japan (1896).....metric tons..	5,019,690	5,531,698
India (1897).....long tons..	4,063,127	4,550,702
New South Wales (1898).....do.....	4,736,000	5,304,320
Spain (1898).....metric tons..	2,526,600	2,784,313
New Zealand (1897).....long tons..	840,713	941,600
Sweden (1897).....metric tons..	224,343	251,264
Italy (1897).....do.....	314,222	346,273
South African Republic (1897).....long tons..	1,600,212	1,792,237
Queensland (1897).....do.....	358,407	401,416
Victoria (1897).....do.....	236,277	264,630
Natal (1897).....do.....	243,960	273,235
Cape Colony (1897).....do.....	113,851	127,513
Tasmania (1897).....do.....	46,674	52,275
Other countries (a).....do.....	2,000,000	2,240,000
Total.....		731,534,602
Percentage of the United States.....		30

a Includes China, Turkey, Servia, Portugal, United States of Colombia, Chile, Borneo and Labuan, Mexico, Peru, Greece, etc.

In the following pages will be found a statement of the production of coal in the more important producing countries since 1868. This statement is interesting as showing the remarkable development of the industry in the United States. In 1868 this country produced only 14.35 per cent of the world's total. Great Britain's output was more than 3.6 times that of the United States, and more than half of the world's total. Germany's product was nearly 15 per cent more than that of this country and more than 15 per cent of the total output in the world. France produced nearly half as much as the United States.

World's production of coal, by countries, since 1868.

Year.	United States.		Great Britain.	
	Long tons.	Short tons.	Long tons.	Short tons.
1868.....	28,258,000	31,648,960	103,141,157	115,518,096
1869.....	28,268,000	31,660,160	107,427,557	120,318,864
1870.....	32,863,000	36,806,560	110,431,192	123,682,935
1871.....	41,384,000	46,350,080	117,352,028	131,434,271
1872.....	45,416,000	50,865,920	123,497,316	138,316,994
1873.....	51,004,000	57,124,480	128,680,131	144,121,747
1874.....	46,916,000	52,545,920	126,590,108	141,780,921
1875.....	46,686,000	52,288,320	133,306,485	149,303,263
1876.....	47,500,000	53,200,000	134,125,166	150,220,186
1877.....	53,948,000	60,421,760	134,179,968	150,281,564
1878.....	51,655,000	57,853,600	132,612,063	148,525,511
1879.....	59,333,000	66,452,960	133,720,393	149,766,840
1880.....	63,822,830	71,481,569	146,969,409	164,605,738
1881.....	76,865,357	85,881,030	154,184,300	172,686,416
1882.....	92,219,454	103,285,789	156,499,977	175,279,974
1883.....	102,867,969	115,212,125	163,737,327	183,385,806
1884.....	106,906,295	119,735,051	160,757,779	180,048,712
1885.....	99,069,216	110,957,522	159,351,418	178,473,588
1886.....	101,500,024	113,680,027	157,518,482	176,420,700
1887.....	116,651,974	130,650,211	162,119,812	181,574,189
1888.....	132,731,613	148,659,407	169,935,219	190,327,445
1889.....	126,097,869	141,229,613	176,916,724	198,146,731
1890.....	140,866,931	157,770,963	181,614,288	203,408,003
1891.....	150,505,954	168,566,668	185,479,126	207,736,621
1892.....	160,115,242	179,329,071	181,786,871	203,601,296
1893.....	162,814,977	182,352,774	164,325,795	184,044,890
1894.....	152,447,791	170,741,526	188,277,525	210,870,828
1895.....	172,426,366	193,117,530	189,661,362	212,320,725
1896.....	171,416,390	191,986,357	195,361,260	218,804,611
1897.....	178,769,344	200,221,665	202,129,931	226,385,523
1898.....	196,405,953	219,974,667	202,054,516	226,301,058

World's production of coal, by countries, since 1868—Continued.

Year.	Germany.		France.	
	Metric tons.	Short tons.	Metric tons.	Short tons.
1868.....	32, 879, 123	36, 249, 233	13, 330, 826	14, 697, 236
1869.....	34, 343, 913	37, 864, 164	13, 509, 745	14, 894, 494
1870.....	34, 003, 004	37, 488, 312	13, 179, 788	14, 530, 716
1871.....	37, 856, 110	41, 736, 361	13, 240, 135	14, 597, 249
1872.....	42, 324, 467	46, 662, 725	16, 100, 773	17, 751, 102
1873.....	46, 145, 194	50, 875, 076	17, 479, 341	19, 270, 973
1874.....	46, 658, 145	51, 440, 605	16, 907, 913	18, 640, 974
1875.....	47, 804, 054	52, 703, 970	16, 956, 840	18, 694, 916
1876.....	49, 550, 461	54, 629, 383	17, 101, 448	18, 854, 346
1877.....	48, 229, 882	53, 173, 445	16, 804, 529	18, 526, 993
1878.....	50, 519, 899	55, 698, 188	16, 960, 916	18, 699, 410
1879.....	53, 470, 716	58, 951, 464	17, 110, 979	18, 864, 854
1880.....	59, 118, 035	65, 177, 634	19, 361, 564	21, 346, 124
1881.....	61, 540, 485	67, 848, 385	19, 765, 983	21, 791, 996
1882.....	65, 378, 211	72, 079, 478	20, 603, 704	22, 715, 584
1883.....	70, 442, 648	77, 663, 019	21, 833, 884	23, 520, 607
1884.....	72, 113, 820	79, 505, 487	20, 023, 514	22, 075, 924
1885.....	73, 675, 515	81, 227, 255	19, 510, 530	21, 510, 359
1886.....	73, 682, 584	81, 235, 049	19, 909, 894	21, 950, 658
1887.....	76, 232, 618	84, 046, 461	21, 287, 589	23, 469, 567
1888.....	81, 960, 083	90, 360, 992	22, 602, 894	24, 919, 691
1889.....	84, 973, 230	93, 640, 500	24, 303, 509	26, 794, 619
1890.....	89, 290, 834	98, 398, 500	26, 083, 118	28, 756, 638
1891.....	94, 252, 278	103, 913, 136	26, 024, 893	28, 692, 444
1892.....	92, 544, 050	102, 029, 815	26, 178, 701	28, 862, 018
1893.....	95, 426, 153	105, 207, 334	25, 650, 981	28, 280, 207
1894.....	98, 805, 702	108, 883, 884	27, 459, 137	30, 273, 699
1895.....	103, 957, 639	114, 561, 318	28, 019, 893	30, 877, 922
1896.....	112, 471, 106	123, 943, 159	29, 189, 900	32, 167, 270
1897.....	120, 474, 485	132, 762, 882	30, 797, 629	33, 938, 987
1898.....	130, 928, 490	144, 283, 196	32, 439, 786	35, 748, 644

World's production of coal, by countries, since 1868—Continued.

Year.	Austria-Hungary.		Belgium.	
	Metric tons.	Short tons.	Metric tons.	Short tons.
1868.....	7, 021, 756	7, 741, 486	12, 298, 589	13, 559, 194
1869.....	7, 663, 043	8, 448, 505	12, 943, 994	14, 270, 753
1870.....	8, 355, 945	9, 212, 429	13, 697, 118	15, 101, 073
1871.....	8, 437, 401	9, 302, 235	13, 733, 176	15, 140, 827
1872.....	8, 825, 896	9, 730, 550	15, 658, 948	17, 263, 990
1873.....	10, 104, 769	11, 140, 508	15, 778, 401	17, 395, 687
1874.....	12, 631, 364	13, 926, 079	14, 669, 029	16, 172, 604
1875.....	13, 062, 738	14, 395, 137	15, 011, 331	16, 549, 992
1876.....	13, 000, 000	14, 327, 300	14, 329, 578	15, 798, 360
1877.....	13, 500, 000	14, 883, 750	13, 669, 077	15, 070, 157
1878.....	13, 900, 000	15, 324, 750	14, 899, 175	16, 426, 340
1879.....	14, 500, 000	15, 986, 250	15, 447, 292	17, 030, 640
1880.....	14, 800, 000	16, 317, 000	16, 886, 698	18, 617, 585
1881.....	15, 304, 813	16, 873, 556	16, 873, 951	18, 603, 531
1882.....	15, 555, 292	17, 149, 709	17, 590, 989	19, 394, 065
1883.....	17, 047, 961	18, 795, 377	18, 177, 754	20, 040, 974
1884.....	18, 000, 000	19, 845, 000	18, 051, 499	19, 901, 778
1885.....	20, 435, 463	22, 530, 098	17, 437, 603	19, 224, 967
1886.....	20, 779, 441	22, 909, 334	17, 285, 543	19, 057, 311
1887.....	21, 879, 172	24, 121, 787	18, 378, 624	20, 262, 433
1888.....	23, 859, 608	26, 305, 218	19, 218, 481	21, 188, 375
1889.....	25, 328, 417	27, 924, 580	19, 869, 980	21, 906, 653
1890.....	27, 504, 032	30, 323, 195	20, 365, 960	22, 453, 471
1891.....	28, 823, 240	31, 777, 622	19, 675, 644	21, 692, 398
1892.....	29, 037, 978	32, 014, 371	19, 583, 173	21, 590, 448
1893.....	30, 449, 304	33, 570, 358	19, 410, 519	21, 400, 097
1894.....	31, 492, 000	34, 704, 184	20, 458, 827	22, 555, 857
1895.....	32, 654, 777	35, 985, 564	20, 450, 604	22, 536, 566
1896.....	33, 676, 411	37, 111, 405	21, 252, 370	23, 420, 112
1897.....	35, 858, 000	39, 515, 516	21, 534, 629	23, 731, 161
1898.....		(a)	22, 075, 093	24, 326, 752

a Latest available figures are used in making up totals.

MINERAL RESOURCES.

World's production of coal, by countries, since 1868—Continued.

Year.	Russia.		Japan.	
	Metric tons.	Short tons.	Metric tons.	Short tons.
1868.....				
1869.....				
1870.....	696, 673	768, 082		
1871.....				
1872.....				
1873.....				
1874.....				
1875.....	1, 709, 718	1, 884, 964		
1876.....				
1877.....				
1878.....	2, 483, 575	2, 738, 141		
1879.....	2, 874, 790	3, 169, 456		
1880.....	3, 238, 470	3, 570, 413		
1881.....	3, 439, 787	3, 792, 365		
1882.....	3, 672, 782	4, 049, 242		
1883.....	3, 916, 105	4, 317, 506	1, 021, 000	1, 125, 142
1884.....	3, 869, 689	4, 266, 332	1, 159, 000	1, 277, 218
1885.....	4, 207, 905	4, 639, 215	1, 314, 000	1, 448, 028
1886.....	4, 506, 027	4, 967, 895	1, 402, 000	1, 545, 004
1887.....	4, 464, 174	4, 921, 752	1, 785, 000	1, 967, 070
1888.....	5, 187, 312	5, 719, 011	2, 044, 000	2, 252, 488
1889.....	6, 215, 577	6, 852, 674	2, 435, 000	2, 683, 370
1890.....	6, 016, 525	6, 633, 219	2, 653, 000	2, 923, 606
1891.....	6, 233, 020	6, 871, 905	3, 230, 000	3, 559, 460
1892.....	6, 816, 323	7, 514, 996	3, 228, 000	3, 557, 256
1893.....	7, 535, 000	8, 307, 337	3, 350, 000	3, 691, 700
1894.....	8, 629, 000	9, 509, 158	4, 311, 000	4, 750, 722
1895.....	9, 079, 138	10, 005, 210	4, 849, 000	5, 343, 598
1896.....	9, 229, 000	10, 170, 358	5, 019, 690	5, 531, 698
1897.....	11, 207, 475	12, 350, 638		
1898.....		(a)		(a)

a Latest available figures are used in making up totals.

World's production of coal, by countries, since 1865—Continued.

Year.	Other countries.	Total.	Per cent of United States.
	Short tons.	Short tons.	
1868.....	1, 147, 330	220, 561, 535	14. 35
1869.....	1, 104, 563	228, 561, 503	13. 85
1870.....	1, 063, 121	238, 653, 228	15. 42
1871.....	1, 114, 248	259, 675, 271	17. 85
1872.....	1, 268, 115	281, 859, 396	18. 05
1873.....	1, 502, 516	301, 430, 987	18. 95
1874.....	2, 706, 756	297, 215, 859	17. 68
1875.....	2, 639, 104	306, 459, 666	16. 95
1876.....	2, 597, 143	309, 626, 718	17. 18
1877.....	2, 821, 155	315, 178, 824	19. 17
1878.....	3, 176, 050	318, 441, 990	18. 17
1879.....	3, 362, 605	333, 585, 069	19. 92
1880.....	3, 621, 342	364, 737, 405	19. 60
1881.....	5, 185, 974	392, 663, 253	21. 87
1882.....	6, 128, 631	420, 062, 472	24. 58
1883.....	6, 929, 841	450, 990, 397	25. 55
1884.....	7, 367, 309	454, 022, 811	26. 37
1885.....	7, 570, 507	447, 581, 529	24. 79
1886.....	9, 082, 815	450, 848, 791	25. 22
1887.....	^a 10, 399, 273	481, 362, 743	27. 14
1888.....	11, 493, 176	521, 225, 803	28. 52
1889.....	12, 618, 299	531, 797, 039	26. 56
1890.....	13, 025, 637	563, 693, 232	27. 99
1891.....	14, 744, 329	587, 554, 583	28. 69
1892.....	14, 998, 633	593, 497, 904	30. 22
1893.....	15, 783, 599	582, 638, 296	31. 30
1894.....	^b 18, 197, 510	610, 487, 368	27. 97
1895.....	^c 19, 428, 643	644, 177, 076	29. 98
1896.....	^d 20, 866, 748	664, 001, 718	28. 92
1897.....	^e 22, 074, 093	696, 512, 163	28. 75
1898.....	^f 23, 502, 433	^f 731, 534, 602	30. 07

^a From 1887 to 1893, inclusive, the total includes, in addition to the countries named on the following pages, the estimated output of countries not specified. The amounts added for this factor each year are as follows: 1887, 500,000 tons; 1888, 700,000 tons; 1889, 900,000 tons; 1890, 1,000,000 tons; 1891, 1,000,000 tons; 1892, 1,400,000 tons; 1893, 1,500,000 tons.

^b This includes, in addition to the countries named on the following pages, the output of Natal, 169,702 tons; Cape Colony, 78,053 tons; Tasmania, 34,633 tons; China, Turkey, Servia, Portugal, etc. (estimated), 2,240,000 tons. Total, 2,522,388 tons.

^c This includes, in addition to the countries named on the following pages, the output of Natal, 172,425 tons; Cape Colony, 98,543 tons; Tasmania, 41,279 tons; China, Turkey, Servia, Portugal, etc. (estimated), 2,240,000 tons. Total, 2,552,247 tons.

^d This includes, in addition to the countries named on the following pages, the output of Natal, 241,920 tons; Cape Colony, 117,969 tons; Tasmania, 40,615 tons; China, Turkey, Servia, Portugal, etc. (estimated), 2,240,000 tons. Total, 2,640,504 tons.

^e This includes, in addition to the countries named on the following pages, the output of Natal, 273,235 tons; Cape Colony, 127,513 tons; Tasmania, 52,275 tons; China, Turkey, Servia, Portugal, etc. (estimated), 2,240,000 tons. Total, 2,693,023 tons.

^f Latest available figures are used in making up total.

MINERAL RESOURCES.

Product of minor coal-producing countries since 1868.

Year.	New South Wales.		Queensland.	
	Long tons.	Short tons.	Long tons.	Short tons.
1868.....	954, 231	1, 068, 739	19, 611	21, 964
1869.....	919, 774	1, 030, 147	11, 120	12, 454
1870.....	868, 564	972, 791	22, 639	25, 356
1871.....	898, 784	1, 006, 638	17, 000	19, 040
1872.....	1, 012, 426	1, 133, 917	27, 727	31, 054
1873.....	1, 192, 862	1, 336, 005	33, 613	37, 647
1874.....	1, 304, 567	1, 461, 115	43, 443	48, 656
1875.....	1, 329, 729	1, 489, 296	32, 107	35, 960
1876.....	1, 319, 918	1, 478, 308	50, 627	56, 702
1877.....	1, 444, 271	1, 617, 584	60, 918	68, 228
1878.....	1, 575, 497	1, 764, 556	52, 580	58, 890
1879.....	1, 583, 381	1, 773, 387	55, 012	61, 613
1880.....	1, 466, 180	1, 642, 122	58, 052	65, 018
1881.....	1, 769, 597	1, 981, 949	65, 612	73, 485
1882.....	2, 109, 282	2, 362, 396	74, 436	83, 368
1883.....	2, 521, 457	2, 824, 032	104, 750	117, 320
1884.....	2, 749, 109	3, 079, 002	120, 727	135, 214
1885.....	2, 878, 863	3, 224, 327	209, 698	234, 862
1886.....	2, 830, 175	3, 169, 796	228, 656	256, 094
1887.....	2, 922, 497	3, 273, 197	238, 813	267, 470
1888.....	3, 203, 444	3, 587, 857	311, 412	348, 781
1889.....	3, 655, 632	4, 094, 308	265, 507	297, 368
1890.....	3, 060, 876	3, 428, 181	338, 344	378, 945
1891.....	4, 037, 929	4, 522, 480	271, 603	304, 195
1892.....	3, 780, 968	4, 234, 684	265, 086	296, 896
1893.....	3, 278, 328	3, 671, 727	264, 403	296, 131
1894.....	3, 672, 076	4, 112, 725	270, 705	303, 190
1895.....	3, 737, 536	4, 186, 040	322, 977	361, 734
1896.....	3, 909, 517	4, 378, 659	371, 000	415, 520
1897.....	4, 383, 591	4, 909, 622	358, 407	401, 416
1898.....	4, 736, 000	5, 304, 320	.....	(a)

a Latest available figures are used in making up totals.

Product of minor coal-producing countries since 1863—Continued.

Year.	New Zealand.		Victoria.		Canada.
	Long tons.	Short tons.	Long tons.	Short tons.	Short tons.
1868.....					
1869.....					
1870.....					
1871.....					
1872.....					
1873.....					
1874.....					1,058,446
1875.....					984,905
1876.....					933,803
1877.....					1,002,395
1878.....	162,218	181,684			1,034,081
1879.....	231,218	258,964			1,123,863
1880.....	299,923	335,913			1,424,635
1881.....	337,262	377,733			1,487,182
1882.....	378,272	423,665			1,811,708
1883.....	421,764	472,376			1,806,259
1884.....	480,831	538,531			1,950,080
1885.....	511,063	572,390			1,879,470
1886.....	534,353	598,475			2,091,976
1887.....	558,620	625,654			2,418,494
1888.....	613,895	687,562			2,658,134
1889.....	586,445	656,818	14,421	16,152	2,719,478
1890.....	637,397	713,885	20,750	23,240	3,117,661
1891.....	668,794	749,049	22,834	25,574	3,623,076
1892.....	673,315	754,113	23,363	26,166	3,292,547
1893.....	691,548	774,534	91,726	102,733	3,201,742
1894.....	719,546	805,892	175,175	196,196	3,903,913
1895.....	727,000	814,240	194,171	217,472	3,512,504
1896.....	793,000	888,160	227,000	255,240	3,743,234
1897.....	840,713	941,600	236,277	264,630	3,786,107
1898.....		(a)		(a)	4,172,655

a Latest available figures are used in making up totals.

MINERAL RESOURCES.

Product of minor coal-producing countries since 1868—Continued.

Year.	India.		Spain.	
	Long tons.	Short tons.	Metric tons.	Short tons.
1868.....				
1869.....				
1870.....				
1871.....				
1872.....				
1873.....				
1874.....				
1875.....				
1876.....				
1877.....				
1878.....				
1879.....				
1880.....				
1881.....	997, 543	1, 117, 248		
1882.....	1, 130, 242	1, 265, 871		
1883.....	1, 315, 976	1, 473, 893		
1884.....	1, 266, 312	1, 418, 269		
1885.....	1, 294, 221	1, 449, 528		
1886.....	1, 401, 295	1, 569, 450	1, 001, 432	1, 104, 079
1887.....	1, 560, 393	1, 747, 640	1, 038, 305	1, 144, 731
1888.....	1, 802, 876	2, 019, 221	1, 036, 565	1, 142, 813
1889.....	2, 045, 359	2, 290, 802	1, 153, 755	1, 272, 015
1890.....	2, 168, 521	2, 438, 744	1, 212, 069	1, 336, 328
1891.....	2, 328, 577	2, 608, 006	1, 287, 988	1, 420, 007
1892.....	2, 537, 696	2, 842, 220	1, 461, 196	1, 610, 969
1893.....	2, 529, 855	2, 833, 438	1, 484, 794	1, 636, 986
1894.....	2, 810, 929	3, 158, 240	1, 657, 010	1, 830, 853
1895.....	3, 538, 000	3, 962, 560	1, 783, 783	1, 965, 729
1896.....	3, 848, 000	4, 309, 760	1, 878, 399	2, 069, 996
1897.....	4, 063, 127	4, 550, 702	1, 939, 400	2, 137, 219
1898.....		(a)	2, 526, 600	2, 784, 313

a Latest available figures are used in making up totals.

Product of minor coal-producing countries since 1868—Continued.

Year.	Italy.		Sweden.		South African Republic.	
	Metric tons.	Short tons.	Metric tons.	Short tons.	Long tons.	Short tons.
1868.....	51,386	56,627	.....	.....	.....	.....
1869.....	56,201	61,962	.....	.....	.....	.....
1870.....	58,770	64,794	.....	.....	.....	.....
1871.....	80,336	88,570	.....	.....	.....	.....
1872.....	93,555	103,144	.....	.....	.....	.....
1873.....	116,884	128,864	.....	.....	.....	.....
1874.....	127,473	140,539	.....	.....	.....	.....
1875.....	116,965	128,943	.....	.....	.....	.....
1876.....	116,399	128,330	.....	.....	.....	.....
1877.....	120,588	132,948	.....	.....	.....	.....
1878.....	124,117	136,839	.....	.....	.....	.....
1879.....	131,318	144,778	.....	.....	.....	.....
1880.....	139,369	153,654	.....	.....	.....	.....
1881.....	134,582	148,377	.....	.....	.....	.....
1882.....	164,737	181,623	.....	.....	.....	.....
1883.....	214,121	235,961	.....	.....	.....	.....
1884.....	223,322	246,213	.....	.....	.....	.....
1885.....	190,413	209,930	.....	.....	.....	.....
1886.....	243,325	268,266	.....	.....	.....	.....
1887.....	327,665	361,251	.....	.....	.....	.....
1888.....	366,794	404,390	.....	.....	.....	.....
1889.....	390,320	432,533	.....	.....	.....	.....
1890.....	376,326	415,500	187,512	206,132	.....	.....
1891.....	289,286	318,938	198,033	218,331	.....	.....
1892.....	295,713	326,024	199,380	219,816	.....	.....
1893.....	317,249	349,767	199,933	220,426	548,534	614,358
1894.....	271,395	299,103	213,633	235,532	791,358	866,321
1895.....	305,321	336,563	223,652	246,464	1,133,466	1,269,482
1896.....	276,197	304,369	226,000	249,052	1,437,297	1,609,772
1897.....	314,222	346,273	224,343	251,264	1,600,212	1,792,237
1898.....	.....	(a)	.....	(a)	.....	(a)

a Latest available figures are used in making up totals.

COAL MINED BY MACHINE IN 1898.

The collection of the statistics relating to the use of machines for the mining of bituminous coal, which were presented in connection with the reports for 1896 and 1897, have been continued for the present report, and the results are shown in the accompanying table. Two corrections have been made in the statistics for 1897, reducing the number of machines used in that year from 1,988 to 1,956, the number of machines having been incorrectly reported by two firms, one in Iowa and one in Virginia. The tonnage by the use of machines, however, was correctly reported. The figures for 1898 show an increase even more noticeable than that shown in 1897 over 1896, particularly in the amount of coal won by machines, which increased from 22,649,220 tons to 32,413,144 tons, a gain of 9,763,924 tons, which was equivalent to a little more than one and one-half times the increase of 1897 over 1896 and 95 per cent of the increase in the five years from 1891 to 1896. The number of machines in use in 1898 was 2,622, as compared with 1,956 in 1897, an increase of practically 34 per cent. The number of firms using machines increased from 211 to 287, an increase of 36 per cent. From these figures it is shown that the average number of tons mined by each machine in 1897 was 11,579, and in 1898, 12,362, an increase of 6.8 per cent in the productive capacity of each machine.

There is scarcely any room to doubt that this great increase in the production of coal by machinery has been the direct cause for the general decline in prices in 1898, which took place notwithstanding the fact that, with a few exceptions, due to local causes, the demand for bituminous coal for 1898 was, for the greater part of the year at least, in excess of the supply, and operators were in many cases throughout the year unable to keep up with their orders. Nor was this unusual demand for coal due to any appreciable extent to the extraordinary cold winter of 1898-99. Demand for fuel was steady throughout the entire summer of 1898, reflecting the industrial revival which prevailed through the iron and other manufacturing centers during the year.

Considering the statistics by States it is seen that machines were introduced into the mines of two States not previously reported, Michigan and New Mexico, the former having 7 machines, which produced 1,456 tons (the machines having been installed late in the year), and the latter having 29 machines which produced 163,849 tons. No report has been received from the company operating in Alaska, and this Territory is excluded from the tabulation of 1898, so that the total number of States and Territories using machines last year was 21, as compared with 20 in 1897, 16 in 1896, and 8 in 1891. The most remarkable increase in the number of machines in use and in the tonnage won by machines was in Pennsylvania, where the number of firms using machines increased practically 50 per cent, from 64 in 1897 to 99 in 1898. The number of machines in use increased 57.2 per cent, from

690 to 1,085, while the product by machines increased from 8,925,293 tons in 1897 to 16,512,480 tons in 1898, a gain of 7,587,187 tons, or 85 per cent. This increase in 1898 was nearly 2.7 times the increase from 1896 to 1897 and one-third more than the increase in the five years from 1891 to 1896. Pennsylvania's machine-mined product in 1898 was within a fraction of 25 per cent of the total bituminous product of that State, as against 16.35 per cent in 1897 and 12.29 per cent in 1896. In Ohio, where the increase in the use of mining machines was next in amount to that of Pennsylvania, the machine-mined product in 1898 amounted to 5,191,375 tons, as compared with 3,843,345 tons in 1897 and 3,368,349 tons in 1896, an increase of 35 per cent, although the number of machines in use increased only 10 per cent, from 224 to 245. Compared with the total product, Ohio's percentage of machine-mined product is larger than that of Pennsylvania, being 35.86 in 1898 and 31.51 in 1897.

Illinois, which is the second State in the Union in point of coal production, shows a decrease in the machine product for 1898 as compared with either 1897 or 1896, although the number of machines in use and the number of firms using machines also show a substantial increase. The decrease in the machine-mined product was due entirely to the labor troubles which demoralized the coal-mining industry in some of the important fields of Illinois during last year. Strikes occurred in the sections of the State where machine mining had its greatest development, and of the 1,500,000 tons decrease in the production of coal in Illinois during 1898, one-third was in the decrease in the production of machine-mined coal. West Virginia, which now outranks Ohio in coal-production, but where, on account of the cheapness of hand labor the introduction of machines has been comparatively slow, shows a machine product in 1898 of 1,323,929 tons, which is practically double that of 1897, and a little over three times that of 1896. Alabama, the fifth in coal-producing importance, has also cheap labor, some of the larger mines being operated by convicts from the State, and the machine-mined product is small, amounting in 1898 to only $4\frac{1}{2}$ per cent of the total output, and 5 per cent of the total output in 1897. Indiana, which with Illinois, Ohio, and Pennsylvania formed what is known as the competitive fields, had in 1898 233 machines in use as compared with 174 in 1897, and the machine product increased from 1,023,361 tons in 1897 to 1,414,342 tons in 1898.

Out of the 20 States and Territories, exclusive of Alaska, which produced coal by the use of machines in both 1897 and 1898, there were 5 whose machine-mined product in 1898 was less than it was in 1897. In Colorado the machine-mined product decreased about one-third, which was due to strikes and consequent loss of time in the lignite mines of Boulder County, where quite a number of machines are in use. The cause of the decrease in Illinois has already been explained. The decrease in the machine-mined product of Montana is a portion of the

total decrease of 168,000 tons in the total product of that State. No explanation is given for the decrease in the machine-mined product of Missouri and Virginia.

The statistics of the production of coal by machines in 1891, 1896, 1897, and 1898 are shown in the following table:

Bituminous coal mined by machines in the United States in 1891, 1896, 1897, and 1898.

State.	Number of firms using machines.				Number of machines in use.			
	1891.	1896.	1897.	1898.	1891.	1896.	1897.	1898.
Alabama			3	2			45	37
Alaska		1	1	(a)		6	6	(a)
Arkansas		1	1	1		14	15	21
Colorado	1	6	8	8	20	34	37	43
Illinois	16	21	35	40	241	307	320	392
Indiana	3	11	11	13	47	186	174	233
Indian Territory		3	3	4		56	54	75
Iowa	2	5	7	9	9	45	49	56
Kansas			1	1			1	2
Kentucky			13	16			162	158
Michigan				1				7
Missouri		1	1	1		4	3	4
Montana		3	2	4		62	61	62
New Mexico				2				29
North Dakota		1	1	3		1	2	7
Ohio	19	31	39	52	114	209	224	245
Pennsylvania	7	41	64	99	72	454	690	1,085
Tennessee			2	4			8	19
Texas			1	1			5	5
Utah		1				1		
Virginia			1	1			8	8
Washington		1				3		
West Virginia	1	7	13	22	8	25	47	86
Wyoming	2	2	4	3	34	39	45	48
Total	51	136	211	287	545	1,446	1,956	2,622

COAL.

345

Bituminous coal mined by machines in the United States in 1891, 1896, 1897, and 1898—
Continued.

State.	Number of tons mined by machines:			
	1891.	1896.	1897.	1898.
Alabama			294,384	298,170
Alaska		15,232	17,920	(a)
Arkansas		21,094	87,532	152,192
Colorado	284,646	318,172	352,400	225,646
Illinois	3,027,305	3,871,410	3,946,257	3,415,635
Indiana	212,830	964,378	1,023,361	1,414,342
Indian Territory		191,585	263,811	274,370
Iowa	41,540	84,556	181,209	218,852
Kansas			4,500	11,722
Kentucky			1,299,436	1,366,676
Michigan				1,456
Missouri		47,827	59,692	52,864
Montana		579,414	720,345	681,613
New Mexico				163,849
North Dakota		15,000	20,000	65,030
Ohio	1,654,081	3,368,349	3,843,345	5,191,375
Pennsylvania	431,440	6,062,644	8,925,293	16,512,480
Tennessee			47,207	152,002
Texas			11,750	15,340
Utah		760		
Virginia			323,649	244,170
Washington		3,920		
West Virginia	205,784	490,944	673,523	1,323,929
Wyoming	354,106	419,647	555,526	631,431
Total	6,211,732	16,424,932	22,649,220	32,413,144

a Not reported in 1898.

Bituminous coal mined by machines in the United States in 1891, 1896, 1897, and 1898—
Continued.

State.	Total tonnage.			
	1891.	1896.	1897.	1898.
Alabama			5,893,770	6,535,283
Alaska		15,232	17,920	(a)
Arkansas		675,374	856,190	1,205,479
Colorado	3,512,632	3,112,400	3,361,703	4,076,347
Illinois	15,660,698	19,786,626	20,072,758	18,599,299
Indiana	2,973,474	3,905,779	4,151,169	4,920,743
Indian Territory		1,366,646	1,336,380	1,381,466
Iowa	3,825,495	3,954,028	4,611,865	4,618,842
Kansas			3,054,012	3,406,555
Kentucky			3,602,097	3,887,908
Michigan				315,722
Missouri		2,331,542	2,665,626	2,688,321
Montana		1,543,445	1,647,882	1,479,803
New Mexico				992,288
North Dakota		78,050	77,246	83,896
Ohio	12,868,683	12,875,202	12,196,942	14,516,867
Pennsylvania	42,788,490	49,557,453	54,417,974	65,165,133
Tennessee			2,888,849	3,022,896
Texas			639,341	686,734
Utah		418,627	521,560	
Virginia			1,528,302	1,815,274
Washington		1,195,504		
West Virginia	9,220,665	12,876,296	14,248,159	16,700,999
Wyoming	2,327,841	2,229,624	2,597,886	2,863,812
Total	93,177,978	115,921,828	139,866,071	158,963,666

a Not reported in 1898.

Bituminous coal mined by machines in the United States in 1891, 1896, 1897, and 1898—
Continued.

State.	Percentage of total product mined by machines.			
	1891.	1896.	1897.	1898.
Alabama			4.99	4.56
Alaska		100.00	100.00	(a)
Arkansas		3.12	10.22	12.63
Colorado	8.10	10.22	10.48	5.54
Illinois	19.33	19.57	19.66	18.36
Indiana	7.16	24.69	24.65	28.74
Indian Territory		14.02	19.74	19.86
Iowa	1.09	2.14	3.93	4.74
Kansas			0.15	0.34
Kentucky			36.07	35.15
Michigan				0.46
Missouri		2.56	2.24	1.97
Montana		37.54	43.71	46.06
New Mexico				16.51
North Dakota		19.22	25.89	77.51
Ohio	12.85	26.16	31.51	35.76
Pennsylvania	1.01	12.29	16.40	25.34
Tennessee			1.63	5.03
Texas			1.84	2.23
Utah		0.18		
Virginia			21.18	13.45
Washington		0.33		
West Virginia	2.23	3.35	4.73	7.93
Wyoming	15.21	18.82	21.38	22.05
Total	6.66	14.17	16.19	20.39

a Not reported in 1898.

COAL TRADE REVIEW.

The unsatisfactory conditions which affected the anthracite coal trade in 1897 continued in 1898. The increasing consumption of bituminous coal for steam raising and of gas and coke for domestic purposes correspondingly restricts the markets for hard coal, and anthracite producers find themselves confronted with a problem which does not appear of easy solution. In order to meet this increasing competition it appears that producers of anthracite coal must either devise some means of reducing prices or submit to a restriction of their product to a comparatively limited market for household consumption. Under present conditions the only way to maintain prices consists in cutting down the production to about 50 or 60 per cent of the capacity

of the mines. It is readily apparent that as the expense of maintenance, executive and clerical force, and fixed charges for interest, etc., are practically the same whether the output be 50,000,000 or 75,000,000 tons, any restriction in product means an increase in the cost of every ton of coal mined. This necessitates a higher selling price, and each advance in price makes customers for bituminous coal or the coke or gas made from it. In the face of such conditions it seems that ultimately many of the smaller mines must be closed indefinitely, and those that are kept at work must be operated continuously, minimizing expenses and cost of production and maintaining low selling prices instead of high ones. Otherwise anthracite coal must become more and more of a luxury and confined to a market in which the price is merely incidental.

The statistics of production presented in this report confirm this analysis. The total anthracite product in 1898 was 47,515,543 long tons, an increase of about 700,000 long tons. Of this increase, however, 470,000 tons was in the amount consumed at the collieries (evinced an increase in cost of up-keep, etc.), and the product shipped to distant markets showed an increase of only a little over 260,000 long tons. Against this must be set a decrease of 30,000 tons in the local sales, which brings the net increase of marketed coal down to 230,000 tons. Moreover, the average price for all marketed anthracite in 1898 was 10 cents per ton less than in 1897, and the total value showed a decrease of nearly 4,000,000. When it is considered that this was in a year of unparalleled industrial activity, business prosperity, and pronounced and general advances in values, it is evident that there is something radically wrong with the anthracite trade.

The bituminous trade, on the other hand, experienced a year of enormous production, reaching a total of 166,592,023 short tons, and while there was a slight decline in price, the increased tonnage at the prices received made the year one of general satisfaction to the operators. For the first time in ten years the demand for soft coal was equal to, and sometimes in excess of the supply. During the winter months many operators had difficulty in filling their orders. At times, owing to the demand for labor in other branches of industry, there was a scarcity of miners and day men, and this in itself was an anomalous condition of affairs. The demand for bituminous coal for industrial purposes continued strong during the early months of 1899, and at the time of writing this report (May, 1899), is still active, so that operators in some districts have not made the usual summer reductions in price and have continued to pay winter rates for mining. In connection with the increased production it is interesting to note the healthy condition of the coal trade generally presented in the reviews of the industry at the principal ports and shipping points, in the following pages. The receipts of coal in 1897 and 1898 at some of these places are condensed in the following table. It will be observed that Chicago alone shows

any material decrease in the receipts of soft coal. This may be charged to the strike in the Illinois coal mines at Pana, etc. The small falling off in soft coal at St. Louis was probably due to the same cause.

	1897.	1898.	Increase.	Decrease.
Philadelphia:				
Anthracite				
Bituminous				
Boston:				
Anthracite	1,981,119	1,866,877		114,242
Bituminous	1,656,919	1,768,442	111,523	
Pittsburg (a).....	15,887,345	18,467,086	2,579,741	
Buffalo:				
Anthracite	4,109,052	4,225,000	115,948	
Bituminous	2,616,185	3,061,446	465,261	
Cleveland:				
Anthracite	201,756	179,891		21,865
Bituminous	3,779,305	4,533,721	754,416	
Toledo (a).....	2,984,834	3,877,678	892,844	
Chicago:				
Anthracite	1,776,400	1,840,858	64,458	
Bituminous	5,373,852	4,976,779		397,073
Milwaukee:				
Anthracite	645,432	768,150	122,718	
Bituminous	910,376	920,911	10,535	
St. Louis:				
Anthracite	172,933	225,616	52,683	
Bituminous	3,349,239	3,342,498		6,741

^a Anthracite and bituminous.

The reviews in the subsequent pages are contributed by officials of boards of trade or other competent authorities.

NEW YORK CITY.

Mr. F. E. Seward, editor of the Coal Trade Journal, has contributed to this report the following review of the coal trade of New York City, part of it being from advance sheets of his annual volume, The Coal Trade:

With the amalgamation of all the New York State communities about this harbor into one city—the city of New York—the estimated coal consumption of the metropolis jumped at once from 6,000,000 tons to at least 10,000,000, for much manufacturing is done in the outlying districts. While the trade is quite well agreed as to the sum total of the tonnage, there is a wide divergence of opinion as to the relative proportion of the several varieties. In the absence of any statistics, we

can scarcely do more than say that the use of anthracite has not increased in the same proportion as the use of soft coal, and from being 10 per cent of the total consumption twenty or twenty-five years ago, bituminous now amounts to at least 50 per cent, and is still growing, though not so fast as a few years ago, most of the large consumers having already changed.

There has been no change in the number of loading ports during the past year, and but little change in the business done at each. The Susquehanna and Western terminal at Edgewater passed into the hands of the Erie Company and was somewhat more extensively used than in the preceding years, and the Weehawken docks of the Erie have got some extra Delaware and Hudson tonnage as a result of the deal which led to the abandonment of the Delaware and Hudson Canal.

The year began with relatively high range of prices and limited production, which indicated a firm market throughout the year. This course was not maintained, the market sagging during the summer months and not recovering tone until the great storm of November had given an impetus to the coal trade throughout the country. After that business was brisk.

The nominal opening prices were as below, free on board at the loading ports, in the beginning of the years named:

Opening prices for free-burning coal at New York for a series of years.

Year.	Broken.	Egg.	Stove.	Chestnut.
1890.....	\$3.40	\$3.50	\$3.50	\$3.25
1891.....	3.50	4.60	3.75	3.50
1892.....	3.65	3.75	3.90	3.65
1893.....	3.90	3.90	4.15	4.15
1894.....	3.50	3.50	3.75	3.75
1895.....	3.35	3.35	3.50	3.35
1896.....	3.25	3.50	3.75	3.50
1897.....	3.75	4.00	4.25	4.00
1898.....	3.60	3.75	4.00	3.75

There are no circulars issued by the New York companies, and in the past year no change in the price list was officially made. The excessive tonnage during the middle of the year caused a falling off in prices realized, and at the close of the year ruling prices were about: Broken, \$3.30; egg, \$3.40; stove, \$3.70, and nut, \$3.50.

The prices realized would not have been unprofitable to the producers had the market requirements been larger, but with a total tonnage of but 41,800,000, the returns were not at all satisfactory. While the tonnage was somewhat greater than in 1897, the difference in prices realized of nearly 30 cents a ton afforded little solace to the operator.

In this market chestnut coal was much in demand and this was looked upon as indicating a revival of the domestic trade throughout this section and in the country to the eastward.

The retail situation continued in a wretched condition until the fall, when a very good trade sprang up and continued to the end of the year and through the winter. The retail exchange became less potential than in the preceding year and exerted little, if any, influence upon the local conditions. The Brooklyn Exchange is practically a thing of the past. There is no wholesale organization. It is improbable that any other business of like importance is conducted without the oversight of some trade organization.

As showing the fluctuation in the value of certain grades of anthracite throughout the year, the following schedule of tide-water averages is appended. These averages include the sizes of commercial coal, known as broken, egg, stove, chestnut, pea, and buckwheat:

Average monthly prices for anthracite coal in New York for three years.

Month.	1896.	1897.	1898.
January	\$2.65	\$2.85	\$3.00
February	2.70	3.11	3.07
March	2.82	3.10	3.09
April	2.87	3.11	3.10
May	2.90	3.09	3.12
June.....	2.97	3.10	3.11
July.....	3.03	3.12	3.06
August.....	3.03	3.12	3.03
September	3.23	3.14	3.01
October.....	3.18	3.11	2.94
November.....	3.18	3.00	2.90
December	3.07	3.00	2.91

As usual, there was no agreement or organization among the soft-coal people and promised increased in railroad freight rates did not materialize, consequently prices remained on the same low level as in the preceding year, some coal being sold here at \$1.50 per ton, free on board, until the resumption of manufacturing industries in the fall gave a stimulus to the market and increased the rate on the comparatively small amount of coal sold in small lots. The storm in November had a great effect upon the soft coal trade, crippling the vessel service as had never been done before. Freight rates East advanced at once to almost unheard-of prices, and the selling price of spot coal at all points advanced in consequence. The Atlantic Transportation Company, organized in the interests of one of the principal shippers, was the subject of much curiosity on the part of the trade because of its ambitious plans. It soon became apparent that the low rates at

which it took contracts were not profitable, and partly as a result of the November storm it went into receivership, and is now doing business on a higher schedule. The new year opens with the soft-coal trade on a much better basis in all parts of the country, caused by the increased demand from manufacturers and a lack of the undue skimming for orders, which has recently characterized it. Ruling prices during the past year were about as follows: Clearfield, \$1.50; Pocahontas, \$1.80; New River, \$1.80, at their loading ports. A fair exhibit of the course of prices of the best Georges Creek coal delivered on the wharf to dealers' carts is shown below:

Average prices for Georges Creek, Maryland, coal at New York.

Year.	Per ton.	Year.	Per ton.
1891.....	\$3.50	1895.....	\$2.75
1892.....	3.40	1896.....	3.00
1893.....	3.25	1897.....	2.60
1894.....	3.00	1898.....	2.25

New York City is surrounded by waterways, so that the bulk of the coal that is delivered for consumption by the varied industries centering therein has mainly to be handled more than once before it reaches the furnace, whether domestic or for steam-raising. The Greater New York comprises within its borders a population numbering nearly 4,000,000 persons, and as there is usually a long period of coal-burning weather, the amount of fuel that is consumed reaches about 10,000,000 tons annually. This quantity, of course, includes the fuel supply of the lines of ocean, coastwise, and harbor steamers; that used by such large concerns as the oil and sugar refineries, and then the thousand and one steam plants within the limits. Anyone who has noticed the jets of steam arising from the pipes above the roofs of the buildings must conclude that there is a large amount of fuel used in the offices, public and other buildings, the hotels, etc., of this city.

Beside being so large a center for the use of fuel, it is a distributing point also, and the offices of all the producing companies in the anthracite districts of Pennsylvania are to be found here, as well as of many of those mining soft coal in Pennsylvania, Maryland, and West Virginia. There are on the New Jersey side of the Hudson River and Staten Island loading ports where the annual tonnage gets up into the millions. Beginning at the southernmost, there is South Amboy, where anthracite arriving by the Pennsylvania Railroad is handled, together with soft coal from Pennsylvania and Maryland. Next is Perth Amboy, the terminal of the Lehigh Valley Railroad for its anthracite tonnage. Then comes Port Reading, where soft coal from the Beech Creek region and anthracite is loaded from the cars of the Philadelphia and Reading Company. Next is the anthracite loading port of the Central Railroad of New Jersey at Port Johnston, and then (opposite New York City) we have Port Liberty, where both hard and soft coal by districts tributary to the Philadelphia and Reading are

loaded. A large amount of soft coal from the Clearfield districts of Pennsylvania is loaded, mainly for the steamship trade of the harbor, at the pier of the Pennsylvania Railroad at Jersey City. Next above is Hoboken, where an immense tonnage of anthracite arriving over the Delaware, Lackawanna and Western Railroad is loaded into barges and schooners. Then there is Weehawken, whence the anthracite coal of the Erie, Pennsylvania Coal Company, Susquehanna and Western, and the Delaware and Hudson companies is delivered. There are Cornwall, Newburg, and Rondout up the river, but apart from Newburg, whence we have the Pennsylvania Coal Company's coal, there is little for New York, and in fact this year New York will receive none from Rondout, as the Delaware and Hudson Company has abandoned the canal to that point and the port as a loading place. Fully 9,000,000 tons of anthracite and 3,000,000 tons of soft coal are received through these places, and then there must be added Chesapeake and Ohio soft coal from Newport News, and Pocahontas coal from Norfolk by barges. New York also gets some Reynoldsville coal, and that is about the extreme of the Pennsylvania steam coal, while Fairmont, from the West Virginia district, is another coal that has a long haul.

In spite of all the protests or remarks that appear from time to time in regard to soft coal and its use in cities, it is well known that the use increases in New York. This is because of its cheapness and better steam-raising qualities, and it is noticeable that at many places it is being used, so that it is not a nuisance, because proper appliances are used and intelligent firemen are employed. It is doubtful if the use of anthracite for domestic purposes has increased in ten years. The "natural growth," so called, has been taken up by other fuels, notably gas. Any increase in anthracite has been due entirely to the growth of the use of the small sizes, many of the office buildings now using buckwheat, while the street car power houses and electric light plants are run on pea coal. It is well known that modern houses, such as one finds throughout the city wherein are housed ten to thirty families, do not use ten to thirty times the former amount of coal used when single houses were in vogue. As a rule these places are steam heated from a furnace burning pea coal in the cellar, and cooking is done on gas ranges.

Some of the interesting features of the trade of New York City are given herewith. The elevated railway service needs a supply of 225,000 tons of egg or broken coal a year, for the several lines on Manhattan Island alone. This coal is loaded into barges at one of the New Jersey loading ports and carried up across the bay to the extreme northerly end of the island, where at One hundred and fifty-eighth street and One hundred and twenty-ninth street, on the Harlem River, it is unloaded by the patent appliances of derrick and automatic railways at a cost of but a few cents per ton. It is delivered into bins and there is always a supply on hand in case of strikes or any other emergency in the coal

trade, such as arose some few years ago, when the men at the Jersey loading docks went idle. At that time the Lehigh Valley Coal Company had the contract and the coal-laden cars of that company appeared on the elevated structure with coal all-rail direct from the mines. If the elevated system is changed to electricity of course a large amount of coal will be dispensed with, and that power may be generated with soft coal at less cost than with anthracite. Another large consumer of coal in New York is the Steam Heating Company that is furnishing power for use in many down-town buildings in various ways, as for running elevators, machinery, etc. It is good for 150,000 tons of buckwheat a year and gets its daily supply from boats that are unloaded at the North River water front, and the coal is then carted to the plant and dumped into pockets, whence elevators take it to the top of the building, where are located the furnaces and boilers. This concern has tried soft coal of various grades, but not as a rule with the modern appliances, so that there was the cry of smoke nuisance, although the late president said he often burned soft coal and the result was perfect combustion. The street car lines that use the underground trolley system consume 75,000 tons of pea and buckwheat in the course of a year, and this is delivered by barge from the Jersey shore ports to the power plants. The quantity of fuel used will be largely increased when the new power plant at Kingsbridge and at Ninety-eighth street, East River, are in operation, and these are possibly soft coal consumers, as they have all the latest appliances for economical steam-raising. The Standard Oil people use 300,000 tons a year, and buy any and all grades of coal, both hard and soft, with all manner of mixtures to give results, using up their own waste with culm to good result. The sugar people use about the same quantity and they buy any and everything in the line of fuel, and one of the latest ventures in this line, located in Brooklyn, is using soft coal without giving out a particle of smoke, owing to the patent method of stoking in vogue there. It may be said that the Federal building in New York is another user of soft coal without being a nuisance, and nearly every grade of coal coming to this market has been tested there, and West Virginia coal was used this season. The appliances here are perfection, and the greatest possible economy is had in the way of raising so much steam per pound of coal used. The success has been so great that the Federal building in Brooklyn is also to be fitted with the same appliances for the use of soft coal.

Much of the work of delivery of fuel to the office buildings, where a daily supply is required for lack of storage room, is done at night or early in the day. They nearly all run on pea and buckwheat, and even the great newspaper plants use this fuel on account of its cleanliness. It is the use of the small sizes of anthracite in cities and towns for power purposes that enables the statistical position of that industry to make the showing it does.

BOSTON, MASSACHUSETTS.

Mr. Elwyn G. Preston, secretary of the Boston Chamber of Commerce, has prepared the following statement in regard to the coal trade of that city.

The receipts of coal during 1898 were substantially the same as the previous year, which were the largest ever recorded. The usual table of the receipts of coal at Boston for a series of years is herewith presented:

Receipts of coal at Boston for sixteen years.

Year.	Domestic.				Foreign.	Total.
	By water.		All rail.			
	Anthracite.	Bituminous.	Anthracite.	Bituminous.		
	Long tons.	Long tons.	Long tons.	Long tons.		
1883.						2, 273, 068
1884.						2, 225, 740
1885.						2, 221, 220
1886.					44, 464	2, 500, 000
1887.					13, 966	2, 400, 000
1888.	2, 057, 279	1, 004, 195			10, 081	3, 071, 555
1889.	1, 647, 348	914, 966			5, 538	2, 567, 852
1890.	1, 740, 564	964, 857			14, 072	2, 719, 493
1891.	2, 039, 443	1, 070, 088			5, 842	3, 115, 373
1892.	2, 163, 984	919, 815			1, 416	3, 085, 215
1893.	2, 227, 066	1, 100, 384		a 50, 000	17, 097	3, 394, 567
1894.	2, 237, 599	958, 701		a 71, 303	41, 779	3, 309, 382
1895.	2, 518, 441	977, 762		a 90, 999	21, 009	3, 608, 211
1896.	2, 092, 798	1, 391, 949		a 104, 080	61, 071	3, 649, 898
1897.	1, 948, 283	1, 591, 245	32, 836	65, 674	50, 235	3, 688, 273
1898.	1, 835, 806	1, 706, 929	31, 071	62, 143	17, 122	3, 653, 071

a Total anthracite and bituminous.

Of the total receipts of domestic coal, 1,031,968 tons were forwarded to interior New England points by rail, leaving the net receipts at Boston for local consumption 2,621,103 tons. The net receipts for 1897 were 2,535,561 tons, an increase during the past year of 85,542 tons.

The feature of the year has been the excitement and violent fluctuation in freight rates. The declaration of war with Spain created almost a panic in local circles, and advanced freights to phenomenal figures. The high prices were of short duration, however, as the victory at Manila on May 1 had a quieting influence, and prices were at the normal summer level early in June.

The terrific storms of the latter part of November which created such havoc with coastwise shipping again forced carriers' rates to abnormal figures, and for a time threatened a coal famine in the bituminous grade. It is reported that over forty vessels foundered or beached during that storm, and beside the coal that was thereby lost, large quantities on the way were delayed for several weeks. Traffic was resumed, however, before the depletion of stocks became serious, and apart from fright nothing worse was suffered than the necessity of a number of firms burning hard coal for a few days until the supply of soft coal became replenished.

The range of carriers' rates is given in the following table:

Coal freights to Boston, Massachusetts.

From—	Per ton.
Philadelphia	\$0.55 to \$1.25
Baltimore .....	.60 to 1.35
Norfolk and Newport News .....	.55 to 1.25
New York .....	.40 to 1.20

The maximum prices quoted do not represent altogether the extremes paid for charters, as at times the rates fluctuated wildly from day to day, the prices quoted attempting to give the more conservative figures.

The local trade during the past year has been reasonably satisfactory. The market was dull and quiet during the earlier part of the year, a firmer tone being noted during the early summer, and the dullness of the fall months being succeeded by a much more satisfactory market toward the close of the year.

Georges Creek Cumberland coal sold at the opening of the year at \$3.50 per ton, advancing during the war scare to \$4 and \$4.25, remaining at the former price during the summer months, and again falling off to \$3.50 and later to \$3 at the close.

Stove coal was quoted at \$6 per ton at the beginning of the year, advancing to \$6.50 during the war scare, and then suffering a decline, with the restoration of confidence, to \$5.50 and later to \$5, at which price it closed the year.

The receipts of foreign coal have been very light during the past year, being less in fact than for any year since 1893. The following table shows the receipts of coal at Boston, the shipments to interior points, and the net receipts for consumption, by months, during 1898:

Net receipts of coal (anthracite and bituminous) for 1898, with comparisons.

Month.	Receipts, all routes.		Amount forwarded to interior New England points.		Net receipts (for local consumption).	
	Anthracite.	Bituminous.	Anthracite.	Bituminous.	Anthracite.	Bituminous.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
January	172, 211	145, 479	32, 837	39, 726	139, 374	105, 753
February	115, 980	145, 142	30, 306	36, 577	85, 674	108, 565
March	96, 613	170, 866	24, 262	73, 574	72, 351	97, 292
April	116, 947	167, 056	28, 704	63, 685	88, 243	103, 371
May	239, 682	166, 715	45, 505	74, 642	194, 177	92, 073
June	139, 835	176, 618	23, 183	62, 753	116, 652	113, 865
July	119, 646	142, 962	13, 166	62, 380	106, 480	80, 582
August	175, 598	151, 237	38, 422	64, 530	137, 176	86, 707
September	191, 245	136, 110	26, 450	40, 219	164, 795	95, 891
October	186, 346	124, 790	26, 401	56, 485	159, 945	68, 305
November	167, 140	131, 086	40, 406	40, 169	126, 734	90, 917
December	145, 634	128, 133	39, 318	48, 268	106, 316	79, 865
Total, 1898.	1, 866, 877	1, 786, 194	368, 960	663, 008	1, 497, 917	1, 123, 186
Total, 1897.	1, 981, 119	1, 707, 154	418, 171	734, 541	1, 562, 948	972, 613

PHILADELPHIA, PENNSYLVANIA.

The following review of the coal trade of Philadelphia has been prepared by Mr. Samuel R. Kirkpatrick, railroad editor of the Press:

The anthracite coal trade during the year 1898, in Philadelphia, was irregular, and in the last six months there was a go-as-you-please method, by which the sales agents disposed of their coal at whatever figure they could obtain. There was a rush to sell, and while the circular prices were supposed to be in force, many of the companies issued secret ones, making a cut of from 45 to 50 cents below the open rate. As to profits, there were not many, although some of the larger coal companies have, by the introduction of labor-saving machinery, been enabled to considerably reduce the cost of production. In the early part of the year there was some hesitancy displayed by the dealers, and they only purchased enough coal for immediate use. When the cutting of prices began a better demand sprang up, so that at the beginning of winter most of the coal yards were well stocked. During 1898 the aggregate shipments of anthracite and bituminous coal to this city was 10,138,299 tons, a considerable gain as compared with the 9,801,990 long tons shipped here in 1897, and higher than the record-breaking shipments of 9,914,077 long tons in the year 1895.

The bituminous coal trade was unsettled and prices were lower than ever. While bituminous coal sold in Philadelphia for export and coast-

wise trade as low as \$1.30 a ton in 1897, the price further declined in 1898 to \$1.15, free on board. Georges Creek coal, however, was firm, and brought about \$1.75 a ton. In the previous year the reduction was brought about by a Southern railroad, which was quickly followed by the other companies. The Philadelphia shippers were taught a lesson, and in 1898 they were not the last to make a bid for the year's business. In 1897 the tide-water bituminous business amounted to almost 10,550,000 tons, and in 1898 there was a further advance both in production and consumption. The tide-water tonnage from this port was larger than it was in 1897, amounting to 3,229,000 tons, as against 2,630,000 in 1897 and 2,320,000 tons in 1896. The amount of bituminous coal sold for local use was 1,451,000 tons, as against 1,600,000 tons for the previous year. The reduction in price had a serious effect on the trade, and toward the close of the year the bituminous-coal-carrying roads met and agreed to make an advance in freight rates from 10 to 15 cents a ton, the change to take effect at what is considered the beginning of the bituminous-coal-trade year, April 1.

The consumption of bituminous coal by local manufacturers was not as great in 1898 as it was in 1897. This was due in a measure to the breaking out of the war between the United States and Spain, which for a time caused a falling off in business and a less demand for fuel. As stated above, the local consumption of soft coal was 1,451,000 tons, a decrease of 149,000 tons. Of this amount about 300,000 tons of gas coal was used by the city gas works, although these works are now controlled by the United Gas Improvement Company, and there is a tendency to cut down the amount of bituminous coal used. The decrease in consumption was due principally to the war. It is believed that there are more manufacturers using soft coal now than ever before, and if there is not something done to place both anthracite and bituminous coal on a more equitable footing in regard to freight rates the latter variety of fuel will be more extensively used than ever.

The competition between the anthracite and bituminous coal producers is just as keen as ever, and while the latter variety of fuel did not make much of a gain in 1898, it caused the hard-coal companies some uneasiness. The introduction of soft coal as a fuel into a number of large factories has been a severe blow to the anthracite dealers, and, while it is not thought this fuel will entirely supplant the other, it does, however, keep the anthracite business from expanding. The price of soft coal is an attractive feature, as it is considerably less than what hard coal costs. The price paid for bituminous coal varied, and, owing to the cutting of rates, the consumer got it nearly at his own figures. In the latter part of the year there was a better demand, and, as the companies had trouble in securing cars, the supply was not equal to it. This caused a jump in prices as much as \$1.50 over what they were, but this state of affairs did not continue for more than a month, when the trade became dull and prices normal.

THE ANTHRACITE TRADE.

The anthracite coal trade was in a deplorable state during the best part of 1898. The trade remained steady for the first four months and prices were fairly well maintained, but from May on there was severe competition, which changed the whole situation, and for the remainder of the year the chief aim of the companies was to get rid of their stocks, prices playing a minor part. The shipments from this port to cities and towns outside the Capes of Delaware were 1,469,000 tons, as against 1,600,000 tons in the year 1897 and 1,770,000 tons in the year 1896. This falling off was due to the inability to secure vessels and to the war with Spain. The local demand was satisfactory, the consumption being nearly equal to that of the previous year.

The local consumption of anthracite is placed at 3,500,000 long tons, as against 3,570,000 long tons in 1897 and 3,500,000 long tons in 1896. The reason for the firmness of the supply market was, that late in the season the demand increased, business became better, but prices remained low.

The price circulars of the Philadelphia and Reading Coal and Iron Company, which constitutes the standard, quoted the following prices:

Prices at mines of anthracite coal for Philadelphia delivery in 1897 and 1898.

Size.	1897.			1898.	
	January.	July.	October.	January.	April.
Lump and steamboat...	\$2.50	\$2.50	\$2.50	\$2.50	\$2.50
Broken	2.50	2.45	2.50	2.50	2.25
Egg.....	2.90	2.80	2.90	2.90	2.65
Stove	3.00	2.90	3.00	3.00	2.75
Chestnut.....	2.80	2.65	2.80	2.80	2.50
Pea	1.30	1.30	1.30	1.50	1.50
Buckwheat .....	.85	.85	.85	.80	.85

After April it was a free market and no more circulars were issued. These prices are subject to the usual agents' commission of 15 cents per ton. They are for coal free on board cars at the mines, and railroad freight charges must be paid in addition. While nominally prices changed but little in the latter months of the year, as indicated above, there was a good deal of weakness. There is always some cutting of prices, but generally it is of a character that can be ignored, as the seller who cuts prices, almost always an individual operator, finds it advantageous, owing to the development of unforeseen contingencies in his business, to dispose of a quantity of coal promptly, and when the few cargoes he has to offer are disposed of he is out of the market for an indefinite period except at full circular prices. Competition of this

irregular character is never dangerous and does not fix the market price for the commodity. But the cutting in 1893 was not confined to the individual operator as the large coal producing companies were as great offenders as the small operator. Concessions were allowed, and to those who would buy a large quantity a severe cut would be made. There are no records to show the lowest price at which stove coal sold, but it is stated on good authority that there were a few cases when a number of car loads were sold at \$1.95 a ton. Two dollars a ton was frequent, but most of the coal brought about \$2.25. The following table shows the actual selling prices of prepared sizes for years 1896, 1897, and 1898:

Selling prices of prepared anthracite coal at Philadelphia for three years.

Month.	Sizes.	1896.	1897.	1898.
January	Broken	\$2.25	\$2.40	\$2.00
	Egg	2.65	2.80	2.40
	Stove	2.75	2.90	2.50
	Nut	2.50	2.65	2.30
February	Broken	2.25	2.40	2.00
	Egg	2.65	2.80	2.40
	Stove	2.75	2.90	2.50
	Nut	2.50	2.65	2.30
March	Broken	2.25	2.40	2.00
	Egg	2.65	2.80	2.40
	Stove	2.75	2.90	2.50
	Nut	2.50	2.65	2.30
April	Broken	2.25	2.40	2.00
	Egg	2.65	2.80	2.40
	Stove	2.75	2.90	2.50
	Nut	2.50	2.65	2.30
May	Broken	2.25	2.25	2.10
	Egg	2.65	2.50	2.15
	Stove	2.75	2.75	2.25
	Nut	2.50	2.65	2.10
June	Broken	2.25	2.25	2.10
	Egg	2.65	2.65	2.30
	Stove	2.75	2.75	2.25
	Nut	2.50	2.50	2.10
July	Broken	2.40	2.40	2.10
	Egg	2.80	2.80	2.30
	Stove	2.90	2.90	2.25
	Nut	2.65	2.65	2.10
August	Broken	2.40	2.40	2.00
	Egg	2.80	2.80	2.30
	Stove	2.90	2.90	2.25
	Nut	2.65	2.65	2.10

Selling prices of prepared anthracite coal at Philadelphia for three years—Continued.

Month.	Sizes.	1896.	1897.	1897.
September	Broken	\$2.50	\$2.40	\$2.00
	Egg	2.90	2.80	2.30
	Stove	3.00	2.90	2.25
	Nut	2.80	2.65	2.10
October	Broken	2.50	2.50	2.00
	Egg	2.90	2.90	2.15
	Stove	3.00	3.00	2.25
	Nut	2.80	2.80	2.10
November	Broken	2.50	2.25	2.00
	Egg	2.90	2.80	2.15
	Stove	3.00	2.90	2.25
	Nut	2.80	2.65	2.10
December	Broken	2.50	2.25	2.00
	Egg	2.90	2.80	2.15
	Stove	3.00	2.90	2.25
	Nut	2.80	2.65	2.10

There was no change in freight rates for local delivery during the year. The charges, which vary according to the region from which the shipment is made and according to the size of coal, were as follows:

Freight rates on anthracite coal from regions to Philadelphia.

Regions.	Prepared sizes.	Pea.	Buckwheat.
Schuylkill	\$1.70	\$1.40	\$1.25
Lehigh	1.75	1.45	1.30
Wyoming	1.80	1.50	1.35

Pea coal is now classed as a domestic fuel, as it is every year being more extensively used by housekeepers. It is cheaper, and retails from \$1.50 to \$2 a ton below the selling price of egg, stove, and chestnut. It costs the dealer from \$1.10 to \$1.40 below the price of stove at the mines. It is used at the power stations of the passenger-railway companies, at the pumping stations of the water department, and in the establishments of a few steam raisers in the heart of the city, but nearly all the rest went into retail dealers' yards for domestic distribution. Great improvements have been made in the machinery for preparing this coal for the market, and it now comes uniform in size and free from slate and dirt. There is still considerable talk about increasing the price of pea coal or making an advance in freight rates, but as yet nothing has been done. It is being more extensively used for domestic

purposes. Chestnut is another size which is in demand. While pea coal is thus gradually being withdrawn from the reach of manufacturers, they in turn are seeking smaller sizes. Some now consume the lower-priced buckwheat or No. 2 pea, and some have taken up the even cheaper rice.

THE EXPORT TRADE.

The shipments of coal to foreign countries out of this port were larger than in 1897. Nearly all the anthracite coal exported was sent to Cuba, 10,871 long tons out of the total of 12,697 tons going to that island. Most of the bituminous coal was also sent to Cuba, a total of 175,710 long tons out of 476,602 being shipped there.

The war in Cuba created a better demand for bituminous coal as the United States fleet was off that coast for a long time and, besides, at the close of the war large quantities were forwarded. The supply of vessels for coastwise port was inadequate and freight rates were considerably higher, advancing from 60 cents to \$1.75 to Boston. To points this side the rate was about 10 cents less. There has been a vast change in the handling of this coastwise business. Four years ago not over 33 per cent of the coal shipped from this port to New England seaboard cities was carried in bottoms belonging to the mining or railroad companies, but in 1898 fully 75 per cent of the tonnage was so carried, and the percentage promises to increase until practically the whole business will be so conducted. This practice enables the producer to name a price for coal delivered at destination, and introduce a new element of flexibility into the price circulars.

The Reading company has extended its transportation system to Boston, as it owns 40 barges, besides several steam colliers and a number of powerful tugboats.

Through the courtesy of the officers of the Pennsylvania Railroad Company, the Philadelphia and Reading Railway Company, and the Baltimore and Ohio Railroad Company, the data have been furnished from which the following tables have been compiled, showing the distribution of coal at Philadelphia for the export trade, the coastwise and harbor trade, and the Philadelphia local trade. The figures of 1897 are also given for the purpose of comparison.

Distribution of coal at Philadelphia in 1897 and 1898.

[In tons of 2,240 pounds.]

	1897.		1898.	
	Anthracite.	Bituminous.	Anthracite.	Bituminous.
Export.....	23, 898	378, 092	12, 697	476, 602
Coastwise and harbor...	1, 600, 000	2, 630, 000	1, 469, 000	3, 229, 000
Local	3, 570, 000	1, 600, 000	3, 500, 000	1, 451, 000
Total	5, 193, 898	4, 608, 092	4, 981, 697	5, 156, 602

Exports of bituminous coal from Philadelphia, Pa., for 1898, to foreign countries.

Country.	Tons.	Value.
Mexico	135, 148	\$208, 686
British West Indies	22, 127	41, 637
Danish West Indies	44, 601	92, 925
French West Indies	39, 977	88, 325
Haiti	1, 137	2, 079
Cuba	175, 710	334, 597
Bermuda	2, 329	4, 431
Argentine Republic	3, 960	7, 820
Brazil	4, 208	7, 261
Chile	2, 350	3, 888
Venezuela	413	826
Porto Rico	4, 124	8, 343
British Africa	13, 720	24, 447
British Guiana	2, 470	4, 945
Colombia	5, 450	8, 175
Hawaiian Islands	2, 763	8, 289
Philippine Islands	4, 810	14, 430
Canada	3, 900	6, 630
Santo Domingo	1, 650	3, 503
Uruguay	2, 705	5, 410
Portuguese Africa	3, 050	5, 338
Total	476, 602	881, 985

Exports of anthracite coal from Philadelphia, Pa., for 1898.

Country.	Tons.	Value.
Nova Scotia	1, 325	\$4, 345
Cuba	10, 871	35, 983
Mexico	500	1, 000
British Africa	1	3
Total	12, 697	41, 331

PITTSBURG, PENNSYLVANIA.

The accompanying statistics, showing the movement of coal in this most important shipping and manufacturing center, have been compiled from reports made to the Survey by officials of the railroads entering Pittsburg, and the United States Army officers in charge of the Monongahela and Ohio River improvements. Although more coal is shipped to and through Pittsburg than is handled in any other city in the United States, there is no local bureau devoted to the collection of statistics of the city's manufacturing and transportation industries. The officials furnishing the information for this report, and to whom

special acknowledgment is due, are Mr. J. G. Searles, coal freight agent, Pennsylvania Railroad, Philadelphia, Pennsylvania; Mr. W. L. Andrews, assistant coal and coke agent, Baltimore and Ohio Railroad, Pittsburg; Mr. James Means, division freight agent, Pittsburg, Cincinnati, Chicago and St. Louis Railroad, Pittsburg; Mr. Edwin P. Bates, general freight agent, Allegheny Valley Railway, Pittsburg; Mr. F. A. Dean, general freight agent, Pittsburg and Lake Erie Railroad, Pittsburg; Maj. W. H. Bixby, United States Army, in charge of Ohio River improvements; Maj. Charles F. Powell, United States Army, in charge of Monongahela River improvements.

The following table shows that the total amount of coal shipped to and through Pittsburg in 1898 was 18,467,086 tons; an increase of 2,579,741 tons, or more than 16 per cent, over 1897. Of this total in 1898 a little over 10,200,000 tons were shipped to points west of Pittsburg, leaving approximately 8,250,000 tons as the local consumption for Pittsburg and vicinity. This, of course, does not include the coke received and shipped. Complete statistics of the coke movement have not been obtained and are omitted from the total. The consumption of coke in the Pittsburg iron industry amounts to several million tons annually, while practically all of the Western shipments of Connellsville coke pass through Pittsburg en route.

It will be observed that there were only two unimportant exceptions to the general increased coal movement. In both cases they were in the shipments for local consumption and were more than made up by the increases in shipments to Western points over the same lines:

Shipments of coal to and through Pittsburg in 1896, 1897, and 1898.

Transportation route.	1896.	1897.	1898.	Increase in 1898.	Decrease in 1898.
Pennsylvania R. R.:	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>
To Pittsburg and vicinity.....	1,344,685	1,379,718	1,328,540	.....	51,178
To west of Pittsburg.....	688,740	1,206,598	1,243,052	76,454	.....
Baltimore and Ohio R. R.:					
To Pittsburg district.....	552,031	395,265	430,139	34,874	.....
To west of Pittsburg.....	839,145	581,851	656,345	74,494	.....
Pittsburg, Cincinnati, Chicago and St. Louis R. R. s	2,585,547	2,369,022	2,783,816	414,794	.....
Allegheny Valley Rwy.: ^b					
To Pittsburg district.....	162,945	125,445	125,180	.....	265
To west of Pittsburg.....	64,887	20,721	39,977	19,256	.....
Pittsburg and Lake Erie R. R.:					
Local and Pittsburg.....	1,524,357	1,506,296	1,880,000	373,704	.....
To west of Pittsburg.....	3,048,715	3,012,591	3,759,237	746,646	.....
Monongahela River locks:					
To Pittsburg district.....	1,607,062	2,619,469	3,201,306	581,837	.....
To west of Pittsburg.....	4,102,190	2,670,369	2,979,494	309,125	.....
Total shipments.....	16,620,304	15,887,345	18,467,086	2,631,184	51,443
West of Pittsburg ^a.....	10,295,005	8,661,152	10,218,105	1,556,953	.....
Local consumption.....	6,325,299	7,226,193	8,248,981	1,022,788	.....

^a Shipments over the Pittsburg, Cincinnati, Chicago and St. Louis Railroad are separated in the same ratio as the totals of other lines. Total shipments only over this line were reported.

^b Coal originating on this road only. Does not include coal received from the Pennsylvania Railroad and forwarded over the Allegheny Valley Railway.

The most notable increase shown in the above is in the coal shipped over the Pittsburg and Lake Erie Railroad, the total tonnage handled over that line in 1898 being an increase of about 1,120,000 tons, or 25 per cent over the previous year. The next largest increase was in the river shipments, which showed a gain of nearly 900,000 tons. The large increase in water shipments during 1898, was due partly to increased business, compared with former years, and partly to the low water in the Ohio River in 1897, which interfered seriously with the shipments to lower river points.

MONONGAHELA RIVER SHIPMENTS.

Maj. Charles F. Powell, Corps of Engineers, U. S. A., in charge of Monongahela River improvement, reports the tonnage passing through the locks in 1898 at 6,120,800 tons of 2,000 pounds. Maj. W. H. Bixby, in charge of Ohio River improvement, reports that 2,979,494 tons passed through Davis Island dam. The difference between these amounts (3,141,306 tons) represents approximately the amount of river coal consumed at Pittsburg.

Movements of coal through Monongahela River locks and Davis Island dam.

Year.	Passed through locks on Monongahela River.	Passed Davis Island dam, Ohio River, near Pittsburg. (From annual reports, Ohio River improvement).	Difference, approximate consumption of river coal at Pittsburg.
	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>
1890.....	4,652,104	3,420,857	1,231,747
1891.....	4,276,588	2,893,752	1,382,836
1892.....	3,872,340	2,299,294	1,573,046
1893.....	3,860,072	2,364,401	1,495,671
1894.....	4,649,612	2,453,787	2,195,825
1895.....	4,183,596	2,393,873	1,789,723
1896.....	5,709,252	4,102,190	1,607,062
1897.....	5,289,838	2,670,369	2,619,469
1898.....	6,120,800	2,979,494	3,141,306

RECEIPTS AND SHIPMENTS BY RAIL.

The following tables show the receipts and shipments of coal by railroads entering the Pittsburg district:

Receipts of coal via Pennsylvania Railroad in 1896, 1897, and 1898.

To—	1896.	1897.	1898.
	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>
Pittsburg and vicinity	1,344,685	1,379,718	1,328,540
West of Pittsburg.....	688,740	1,206,598	1,283,052
Total	2,033,425	2,586,316	2,611,592

Shipments of coal and coke via Baltimore and Ohio Railroad to and through Pittsburg.

Year.	Pittsburg district.		Via Pittsburg to all points.	
	Coal.	Coke.	Coal.	Coke.
	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>
1896.....	552,031	447,866	839,145	727,219
1897.....	395,265	487,745	581,851	1,020,430
1898.....	430,139	437,343	656,345	1,610,759

Shipments of coal via Allegheny Valley Railway to and through Pittsburg.

Year.	Pittsburg district.	Via Pittsburg to all points.	Total.
	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>
1895.....	162,600	33,399	195,999
1896.....	162,945	64,887	227,832
1897.....	125,445	20,721	146,166
1898.....	125,180	39,977	165,157

The shipments over the Allegheny Valley Railway include only the amount of coal originating on the line of that road. The following table shows the amount of coal and coke received from other lines and forwarded over the Allegheny Valley Railway. The coke to Pittsburg yard came from Connellsville and was only handled in switching limits:

Coal and coke received by Allegheny Valley Railway from other lines and forwarded.

Year.	Pittsburg yard.		Other points.		Total.	
	Coal.	Coke.	Coal.	Coke.	Coal.	Coke.
	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>
1895.....	308,207	275,457	112,825	50,118	421,032	325,575
1896.....	278,299	267,481	80,747	28,335	359,046	295,816
1897.....	387,867	317,547	171,603	64,904	559,470	382,451
1898.....	313,286	247,404	163,981	133,897	477,267	381,301

Shipments of coal over the Pittsburg, Cincinnati, Chicago and St. Louis Railroad.

Year.	Tons
1895.....	2,417,096
1896.....	2,585,547
1897.....	2,369,022
1898.....	2,783,816

Shipments of coal and coke over the Pittsburg and Lake Erie Railroad.

Year.	Coal.	Coke.
	<i>Tons.</i>	<i>Tons.</i>
1895.....	3,546,598	1,866,487
1896.....	4,573,072	1,278,749
1897.....	4,518,887	1,615,673
1898.....	5,639,237	1,550,911

BUFFALO, NEW YORK.

Mr. John Chamberlin, of the Buffalo Review, and correspondent of the Black Diamond, has furnished the following review of the coal trade of that city:

Buffalo has for the last twenty years enjoyed a heavy trade in anthracite and bituminous coal, especially on account of the large amount which is shipped by lake to the upper lake ports, particularly Chicago, Milwaukee, Duluth, and Toledo. About 60 per cent of anthracite receipts are shipped forward by lake. Within the past two seasons there has also sprung up a water traffic in bituminous coal, which had till that time been very small. The amount of soft coal shipped last season was about 9 per cent of the receipts. As it has now been found that the product of the Reynoldsville region in Pennsylvania can compete on the lakes with Pittsburg and Hocking Valley coal, this trade will continue to grow rapidly. The hard-coal trade by lake has not materially increased of late and may possibly be said to have reached its limit, on account of the increase of all-rail competition. The actual utility of the lake route is that large amounts of any commodity can be massed at any port and transferred to another in so short a time. Buffalo, on account of position and facilities, commands the water trade in anthracite. The only competitors in anthracite for the upper lakes are Erie, which shipped 600,000 short tons last season, and Oswego, which shipped to the upper lakes 154,000 tons, which, together, is less than 18 per cent of the anthracite water shipments from Buffalo. The home consumption of coal in Buffalo is not larger than that which any city of its size within a day's haul of the mines should enjoy. Anthracite is used for domestic purposes to the exclusion of bituminous, and in the very small sizes is also used for making steam. As the city is not as yet a great manufacturer of iron, though a plant of the first class has now been located here, the all-rail trade is confined to local demand, and the distribution of both hard and soft coal is limited to the adjacent Canadian territory, in which there is no direct competition except from Oswego and Conneaut, Ohio, the former bringing in hard coal by steamer and the latter soft coal by car ferry.

The following tables show the receipts and shipments of coal at Buffalo for a series of years:

Coal receipts at Buffalo for a series of years.

Year.	Anthracite.	Bituminous.	Blossburg.	Total.
	Tons.	Tons.	Tons.	Tons.
1842.....				1,800
1852.....				57,560
1862.....				239,873
1872.....				790,876
1882.....				3,021,791
1886.....	2,673,778	1,420,956	30,000	4,124,734
1887.....	3,497,203	1,776,217	25,000	5,298,420
1888.....	4,549,015	1,892,823	22,500	6,464,338
1889.....	4,338,570	2,198,327	22,500	6,559,397
1890.....	4,500,000	2,200,000	25,500	6,725,500
1891.....	4,800,000	2,450,000	25,500	7,275,500
1892.....	4,804,760	2,627,441	25,000	7,457,201
1893.....	4,770,546	2,896,614	25,000	7,692,160
1894.....	4,272,130	2,280,470	25,000	6,577,600
1895.....	4,764,038	2,727,548	25,000	7,516,586
1896.....	4,588,061	2,661,840	25,000	7,274,901
1897.....	4,109,052	2,616,185	25,000	6,750,237
1898.....	4,225,000	3,081,446	29,000	7,335,446

Lake shipments of anthracite coal from Buffalo.

Year.	Tons.	Year.	Tons.
1883.....	1,467,778	1891.....	2,365,895
1884.....	1,431,081	1892.....	2,822,230
1885.....	1,428,086	1893.....	2,681,173
1886.....	1,531,210	1894.....	2,475,255
1887.....	1,894,060	1895.....	2,612,768
1888.....	2,514,906	1896.....	2,379,068
1889.....	2,151,670	1897.....	2,229,329
1890.....	2,157,810	1898.....	2,455,191

COAL.

369

Lake shipments of bituminous and Blossburg coal from Buffalo.

Year.	Bituminous.	Blossburg.
	<i>Tons.</i>	<i>Tons.</i>
1887.....	8,706	10,000
1888.....	7,452	5,000
1889.....	11,673	5,000
1890.....	25,872	5,000
1891.....	34,066	5,000
1892.....	54,216	5,000
1893.....	15,000	7,500
1894.....	2,500	7,500
1895.....	2,000	6,000
1896.....	15,000	6,000
1897.....	100,000	5,000
1898.....	228,755	8,000

Shipments of bituminous coal by canal.

Year.	Short tons.	Year.	Short tons.
1890.....	25,872	1895.....	4,250
1891.....	34,060	1896.....	956
1892.....	29,216	1897.....	a 164
1893.....	19,336	1898.....	a 241
1894.....	8,840		

a Anthracite.

Anthracite wholesale circular prices at Buffalo in 1898: Long tons.

Date.	Free on board vessels at Buffalo.				On cars at Buffalo or Suspension Bridge.			
	Grate.	Egg.	Stove.	Chest-nut.	Grate.	Egg.	Stove.	Chestnut.
January 1.....	\$5.05	\$5.30	\$5.30	\$5.30	\$4.75	\$5.00	\$5.00	\$5.00
May 1.....	4.25	4.50	4.50	4.50	4.00	4.25	4.25	4.25
July 1 to close of year.	4.30	4.55	4.55	4.55	4.00	4.25	4.25	4.25

Anthracite retail prices at Buffalo in 1898: Short tons.

Date.	Grate.	Egg.	Stove.	Nut.	Pea.	Blossburg.
January 1.....	\$5.00	\$5.25	\$5.25	\$5.25	\$3.75	\$4.00
May 1.....	4.50	4.75	4.75	4.75	4.00	4.00
July 1 to close of year.	4.50	4.75	4.75	4.75	4.00	4.00

CLEVELAND, OHIO.

The following summary in regard to the coal trade of Cleveland has been contributed by Mr. Munson A. Havens, assistant secretary of the chamber of commerce:

The conditions governing the Cleveland coal market for 1898 were much more uniform as to price than in 1897. For the first half of the year prices were rather firm, but during the last half reached a lower level notwithstanding the car supply was inadequate during the latter part of the year, which assisted in the efforts to sustain prices. Had the railways been able to meet the demands made upon them for cars, prices would have been considerably lower. The market was exceptionally free from disturbances in mining circles.

West Virginia succeeded in 1897 in gaining a foothold in the market for lake shipments to the northwest, which it retained to a large extent during 1898, curtailing the natural output of Ohio and Pennsylvania coal.

The receipts and shipments of both anthracite coal and coke show decreases in 1898, as compared with 1897, but these were more than made up by the increased movement of bituminous coal. The receipts of bituminous coal increased about 20 per cent, or more than 750,000 tons; shipments by lake increased about 80,000 tons, while the rail shipments in 1898 were seven times what they were in 1897.

Coal and coke receipts and shipments at Cleveland since 1887.

RECEIPTS.				
	1887.	1888.	1889.	1890.
	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>
Bituminous	1,454,744	1,737,781	1,600,000	1,560,208
Anthracite	176,769	181,551	160,000	205,856
Coke.....	114,924	124,827	150,000	194,527
Total	1,746,437	2,044,159	1,910,000	1,960,591
SHIPMENTS.				
Anthracite by rail.....	20,296	29,735	25,000	29,056
Bituminous by rail.....	703,506	1,000,000	1,100,000	1,200,000
Bituminous by lake				
Total	723,802	1,029,735	1,125,000	1,229,056

COAL.

371

Coal and coke receipts and shipments at Cleveland since 1887—Continued.

RECEIPTS.				
	1891.	1892.	1893.	1894.
	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>
Bituminous	2,838,586	3,651,080	3,603,984	2,715,540
Anthracite	201,927	259,150	262,266	207,604
Coke.....	189,640	351,527	235,248	298,061
Total	3,230,153	4,261,757	4,101,498	3,221,205
SHIPMENTS.				
Anthracite by rail.....	34,910	50,742	49,497	44,177
Bituminous by rail	1,525,000	1,728,831	24,128	30,000
Bituminous by lake			1,257,326	1,106,000
Coke by rail.....				42,048
Total	1,559,910	1,779,573	1,330,951	1,222,225
RECEIPTS.				
	1896.	1896.	1897.	1898.
	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>
Bituminous	2,842,333	2,994,802	3,779,305	4,533,721
Anthracite	201,022	142,832	201,756	179,891
Coke.....	432,216	338,678	503,935	482,539
Total	3,475,571	3,476,312	4,484,996	5,196,151
SHIPMENTS.				
Anthracite by rail.....	31,894	20,299	33,750	27,650
Bituminous by rail	64,908	25,872	71,770	511,447
Bituminous by lake	1,125,624	1,803,709	2,027,693	2,108,310
Coke by rail	49,536	85,256	117,390	93,628
Total	1,271,962	1,935,136	2,250,603	2,741,035

The Cuyahoga customs district includes the ports of Cleveland, Ash-tabula, Fairport, Lorain, and Conneaut. The following table shows the clearances from this district for the last twelve years:

Clearances of coal from the Cuyahoga (Ohio) district for twelve years.

Year.	Tons.	Year.	Tons.
1887.....	1, 433, 035	1893.....	3, 052, 342
1888.....	1, 855, 260	1894.....	2, 239, 829
1889.....	2, 020, 996	1895.....	2, 948, 324
1890.....	2, 328, 663	1896.....	3, 863, 645
1891.....	2, 635, 461	1897.....	3, 613, 245
1892.....	2, 957, 988	1898.....	3, 844, 239

Wholesale prices of coal at Cleveland, Ohio, in 1898.

Kind.	Average price per ton.	Kind.	Average price per ton.
Bituminous:		Bituminous—Continued.	
Massillon	\$2. 10	Coshocton	\$1. 80
Palmyra	2. 35	Hocking	1. 85
Pittsburg	1. 65	Anthracite:	
Salineville	1. 30	Grate	4. 50
Kentucky cannel	4. 50	Egg.....	4. 75
Goshen.....	1. 35	Stove	4. 75
Sherodsville.....	1. 25	Chestnut.....	4. 75
Osnaburg	1. 30		

TOLEDO, OHIO.¹

The coal receipts at Toledo in 1898 were gratifying to its citizens. The aggregate was 3,877,678 short tons, 892,844 more than in 1897, and larger by 352,893 short tons than the record of any previous year in the history of the city. The increased receipts are considered as a tribute to the city's commercial position and an evidence of an increased demand by the manufacturing industries. The increased harbor facilities, which now allow the admission of the largest lake steamers, make Toledo a desirable port for distribution of coal to Western points, and a continued augmenting not only of the coal traffic but also of receipts and shipments of iron ore and other commodities is looked for when the present channel is widened to 400 feet, with a depth of 21 feet.

¹ From the annual report of Mr. Dennison B. Smith, secretary Produce Exchange.

The following table presents the receipts of coal at Toledo and the transportation routes during the last five years:

Coal receipts at Toledo since 1894.

Railroad.	1894.	1895.	1896.	1897.	1898.
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
Wabash R. R. ....	.....	1,000	5,000	6,000	10,000
Lake Shore and Michigan Southern Rwy..	22,126	38,000	44,000	50,000	60,000
Cincinnati, Hamilton and Dayton R. R....	72,000	30,000	35,000	40,000	50,000
Pennsylvania Co	78,792	.....	529,968	573,000	782,000
Columbus, Hocking Valley and Toledo Rwy	540,000	500,000	850,000	730,000	1,100,000
Toledo and Ohio Central Rwy	767,670	721,914	705,272	777,129	883,692
Lake	116,000	124,000	119,000	88,705	90,000
Wheeling and Lake Erie Rwy	914,220	520,000	646,471	720,000	901,986
Total	2,510,808	1,934,914	2,934,711	2,984,834	3,877,678

The total coal receipts at Toledo during the past thirteen years has been as follows:

Total coal receipts at Toledo since 1886.

Year.	Short tons.	Year.	Short tons.
1886.....	2,340,859	1893.....	3,445,995
1887.....	2,695,713	1894.....	2,510,808
1888.....	3,524,785	1895.....	1,934,914
1889.....	2,840,314	1896.....	2,934,711
1890.....	3,021,886	1897.....	2,984,834
1891.....	2,754,943	1898.....	3,877,678
1892.....	2,291,355		

CHICAGO, ILLINOIS.

The following tables are condensed from the statistical statements compiled by the Chicago bureau of coal statistics, and published in the Black Diamond, January 14, 1899:

The anthracite receipts by lake increased 80,575 tons, while those by rail decreased 16,117 tons, making a net increase of 64,458 tons, as shown in the following table:

Receipts of anthracite coal at Chicago in 1897 and 1898, by months.

Month.	Anthracite by lake.		Anthracite by rail.	
	1898.	1897.	1898.	1897.
	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>
January			43,066	51,649
February			44,478	35,752
March			35,681	26,294
April	60,798	2,300	13,468	14,161
May	140,260	105,405	15,763	13,147
June	92,772	131,253	17,979	35,179
July	93,551	85,132	54,499	38,186
August	248,304	153,949	70,633	65,512
September	197,546	96,830	53,637	56,942
October	164,779	227,491	54,107	62,727
November	228,143	263,945	48,449	90,775
December	88,193	167,466	74,752	52,305
Total	1,314,346	1,233,771	526,512	542,629

Month.	Total anthracite.		1898.	
	1898.	1897.	Increase.	Decrease.
	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>
January	43,066	51,649	.....	8,583
February	44,478	35,752	8,726	.....
March	35,681	26,294	9,387	.....
April	74,266	16,461	57,805	.....
May	156,023	118,552	37,471	.....
June	110,751	166,432	.....	55,681
July	148,050	123,318	24,732	.....
August	318,937	219,461	99,476	.....
September	251,183	153,772	97,411	.....
October	218,886	290,218	.....	71,332
November	276,592	354,720	.....	78,128
December	162,945	219,771	.....	56,826
Total	1,840,858	1,776,400	64,458	.....

The receipts of bituminous coal by rail, with the States from which shipped, are exhibited in the following statement. The lessening of the hold of Ohio coal upon the Chicago market was referred to in the report for 1897. This condition continued in 1898, the receipts by rail from that State showing a decrease of 73,040. But receipts from Illinois and from West Virginia and Kentucky also fell off, the total decrease from the three States amounting to over 525,000 tons. Pennsylvania was the only State showing increased shipments to Chicago (about 186,000 tons), which served to make the general decrease in Chicago's coal receipts somewhat less pronounced. An increase of over 400,000 tons in the receipts of coke offset the falling off in the coal receipts.

Receipts of bituminous coal and coke at Chicago for four years.

State from which received.	1895.	1896.	1897.	1898.	Increase in 1898.	Decrease in 1898.
	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>
Pennsylvania.....	182,169	184,655	211,158	<i>a</i> 397,570	186,412	
Ohio.....	350,156	330,837	313,632	249,192		64,440
West Virginia and Kentucky.	339,873	394,549	640,441	480,369		109,072
Illinois.....	2,401,620	2,589,737	2,628,384	2,275,118		353,266
Indiana.....	1,509,825	1,351,848	1,571,237	1,574,530	3,293	
Total bituminous coal.	4,783,643	4,851,626	5,373,852	4,976,779		397,073
Coke.....	279,874	397,811	527,608	928,893	401,285	

a Receipts by lake, included in this amount, were 191,804 tons.

MILWAUKEE, WISCONSIN.

Mr. William J. Langson, secretary of the Chamber of Commerce at Milwaukee, has kindly allowed the use of the proof sheets of that portion of his report for 1898 bearing upon the coal trade of that city in advance of its publication.

Statistics of the coal trade of Milwaukee in 1898 show an increase in the total supply of 123,253 tons and in shipments of 26,991 tons. The increase in the supply was not equal to the increased consumption, especially of hard coal, for domestic purposes, and before the close of the winter stocks ran so low as to threaten a fuel famine and cause a material advance in prices. As Chicago had no surplus to spare, some of the local dealers had to resort to the process of making "chestnut" coal, by breaking or crushing the larger grades of which the stocks were not totally exhausted. The total receipts of the year were 1,689,061 tons, of which 1,584,439 tons arrived by lake from Ohio and Pennsylvania, 2,526 tons of Ohio coal by car ferry across the lake and 102,096 tons, mostly Illinois coal, by rail.

The supply of coal by lake consisted of 768,150 tons of hard and 816,289 tons of soft coal. The car-ferry and rail receipts may be all

classed as soft coal, although the figures probably include a small quantity of hard coal hauled from the mines by rail when local stocks of that variety approached the danger point. Compared with three preceding years the respective quantities of hard and soft coal received at Milwaukee were approximately as follows:

Receipts of coal at Milwaukee, Wisconsin, for four years.

Kind.	1895.	1896.	1897.	1898.
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
Anthracite	853,680	813,487	645,432	768,150
Bituminous	592,743	774,308	910,376	920,911
Total	1,446,423	1,587,795	1,555,808	1,689,061

Deducting from the total receipts the amount forwarded westward by rail from this point shows that the local consumption of coal at Milwaukee in 1898 was approximately 1,009,203 tons.

A comparison of the receipts of coal at Milwaukee by decades presents a vivid picture of the growth of this trade.

Growth of the coal trade of Milwaukee.

Year.	Receipts.
	<i>Short tons.</i>
1868	92,992
1878	239,667
1888	1,122,243
1898	1,689,061

Great as the increase of the coal trade at Milwaukee has been, that of the last decade does not represent the increased consumption in the territory supplied from this point ten to twenty years ago, because the greater part of that territory is now supplied through other channels involving shorter distances of rail transportation.

COAL.

377

The tables following will show the details of receipts and shipments of coal at Milwaukee in 1898 compared with previous years:

Receipts of coal at Milwaukee for five years.

Source.	1894.	1895.	1896.	1897.	1898.
By lake from—	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
Buffalo.....	658,978	755,831	745,870	545,219	624,616
Erie.....	97,995	86,332	19,879	92,370	134,774
Oswego.....	41,891	33,364	60,309	38,319	37,000
Cleveland.....	105,800	105,469	232,689	305,435	341,898
Ashtabula.....	58,179	99,521	114,625	132,103	115,579
Lorain.....	22,552	27,017	40,460	13,887	11,855
Sandusky.....	7,250	5,179	28,238	42,555	29,572
Toledo.....	90,357	74,603	114,501	216,318	243,818
Charlotte.....		1,153			1,275
Fairport.....	122,573	126,955	97,532	44,621	37,094
Ogdensburg.....	2,065		2,800		1,133
Huron, Ohio.....	3,275	11,229	29,605	44,378	4,159
Other ports.....	18,395	9,950	975	18,323	4,192
Total, lake....	1,229,310	1,336,603	1,487,483	1,493,528	1,586,965
By railroad.....	107,736	109,920	100,312	62,280	102,096
Receipts.....	1,337,046	1,446,423	1,587,795	1,555,808	1,689,061

Shipments of coal from Milwaukee for five years.

Shipped by—	1894.	1895.	1896.	1897.	1898.
Chicago, Milwaukee and St. Paul Rwy.	<i>Short tons.</i> 246,620	<i>Short tons.</i> 398,053	<i>Short tons.</i> 264,650	<i>Short tons.</i> 362,751	<i>Short tons.</i> 398,668
Chicago and North- western Rwy.....	167,753	221,257	169,409	247,979	245,472
Wisconsin Central R. R.....	12,377	17,990	12,318	42,017	31,538
Lake.....	6,018	3,070	306	120	4,180
Total.....	432,768	640,470	446,683	652,867	679,858

MINERAL RESOURCES.

Receipts of coal at Milwaukee by lake and rail annually from 1862 to 1898, inclusive.

Year.	Tons.	Year.	Tons.
1862.....	21, 860	1881.....	550, 027
1863.....	43, 215	1882.....	593, 842
1864.....	44, 503	1883.....	612, 584
1865.....	36, 369	1884.....	704, 166
1866.....	66, 616	1885.....	775, 750
1867.....	74, 568	1886.....	759, 681
1868.....	92, 992	1887.....	842, 979
1869.....	87, 690	1888.....	1, 122, 243
1870.....	122, 865	1889.....	980, 678
1871.....	175, 526	1890.....	996, 657
1872.....	210, 194	1891.....	1, 156, 033
1873.....	229, 784	1892.....	1, 374, 414
1874.....	177, 655	1893.....	1, 249, 732
1875.....	228, 674	1894.....	1, 337, 046
1876.....	188, 444	1895.....	1, 446, 423
1877.....	264, 784	1896.....	1, 587, 795
1878.....	239, 667	1897.....	1, 555, 808
1879.....	350, 840	1898.....	1, 689, 061
1880.....	368, 568		

Freight rates from Buffalo to upper lake ports in 1890.

Month.	Chicago.	Milwaukee.	Duluth and Superior.	Gladstone.
	<i>Cents.</i>	<i>Cents.</i>	<i>Cents.</i>	<i>Cents.</i>
April	20	20	20	.....
May	20	20	20	20
June	20	20	20	20
July	20 to 30	20 to 30	20 to 25	20 to 25
August.....	25 to 30	25 to 30	20 to 25	25
September	25 to 30	25 to 30	20	20
October	25 to 50	25 to 50	20	20
November	40	40	40	40
December to close	40	40	40	40

Yard prices per ton of coal at Milwaukee during the year 1898, reported by R. P. Elmore Company.

Month.	Lacka- wana and Scranton.	Poca- hontas.	Cannel.		Steam coal, Ohio and Erie.
			Bird's- eye.	Butts.	
January	\$5. 75	\$3. 25	\$7. 00	\$5. 50	2. 60 to 2. 80
February	5. 75	3. 25	7. 00	5. 50	2. 60 to 2. 80
March	5. 75	3. 25	7. 00	5. 50	2. 60 to 2. 80
April	5. 75	3. 25	7. 00	5. 50	2. 60 to 2. 80
May	5. 75	3. 25	7. 00	5. 50	2. 60 to 2. 80
June	5. 50	3. 25	7. 00	5. 00	2. 25 to 2. 40
July	5. 75	3. 25	7. 00	5. 00	2. 25 to 2. 40
August	5. 00	3. 25	7. 00	5. 00	2. 25 to 2. 25
September	5. 00	3. 25	7. 00	5. 00	2. 15 to 2. 25
October	5. 00	3. 25	7. 00	5. 00	2. 25 to 2. 45
November	5. 00	3. 25	7. 00	5. 00	2. 35 to 2. 55
December	5. 00	3. 25	7. 00	5. 00	2. 40 to 2. 60

SUPERIOR, WISCONSIN.

Mr. John M. McCabe, secretary of the Superior Commercial Club, furnishes the following statement of coal receipts at Superior since 1887. The coal received in 1898 exceeded that of the previous year by 330,000 tons, or nearly 25 per cent.

Coal receipts at Superior, Wisconsin, for twelve years.

Year.	Tons.	Year.	Tons.
1887.....	226, 289	1893.....	1, 196, 919
1888.....	786, 000	1894.....	1, 456, 400
1889.....	720, 000	1895.....	1, 371, 340
1890.....	875, 000	1896.....	1, 440, 000
1891.....	1, 082, 063	1897.....	1, 471, 200
1892.....	1, 139, 227	1898.....	1, 800, 000

CINCINNATI, OHIO.

The Survey is indebted to Mr. Charles B. Murray, superintendent of the Chamber of Commerce, for the following review of the coal trade at Cincinnati:

The coal received at Cincinnati is almost entirely soft or bituminous, coming mostly from Pittsburg and Kanawha regions. In late years the West Virginia and Virginia mines have greatly enlarged contributions to the supply, owing to the increased rail movement of the product. This is illustrated in the showing of receipts separately

stated, as appearing in the following compilation for a period of nine years, for the Pittsburg and Kanawha districts and all other supplies:

Receipts of coal at Cincinnati since 1890.

Year.	Pittsburg, by river.	Kanawha, by river.	Kanawha, by rail.	Total, Kanawha.	All other kinds.	Total.
	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>
1890.....	42,601,000	19,221,000	2,000,000	21,221,000	4,166,000	67,988,000
1891.....	43,254,000	19,115,000	4,500,000	23,615,000	5,477,000	72,346,000
1892.....	42,272,000	19,215,000	9,300,000	28,515,000	6,072,000	76,859,000
1893.....	28,643,000	24,971,000	18,100,000	43,071,000	8,898,000	80,612,000
1894.....	40,157,000	16,398,000	13,300,000	29,698,000	6,603,000	76,458,000
1895.....	26,676,000	15,106,000	18,900,000	34,006,000	9,461,000	70,143,000
1896.....	36,697,000	22,015,000	13,800,000	35,815,000	7,177,000	79,689,000
1897.....	35,041,000	17,942,000	17,600,000	35,542,000	8,173,000	78,762,000
1898.....	41,271,000	19,949,000	15,900,000	35,849,000	6,823,000	83,943,000

Prior to 1891 the rail receipts of coal at Cincinnati did not reach as great a volume as 5,000,000 bushels in a year, excepting in but one instance.

The foregoing tabulation shows the enlargement of movement of coal by rail under influences attending curtailment of river supplies from low-water interferences.

The arrivals of coal at Cincinnati in 1898 carry the record above any previous year, the gain over 1897 being 5,180,000 bushels, or 6½ per cent. The supply was ample throughout the year, and the average of prices unusually low—in fact, the lowest shown by the records.

The aggregate arrivals of coal for the year were 83,943,000 bushels—3,026,000 tons. Of this quantity only 948,000 bushels represented anthracite. The total receipts in 1897 were 78,762,000 bushels, and for five years ending with 1897 the annual average was 77,133,000 bushels, compared with which 1898 makes an increase of nearly 9 per cent.

Of the total receipts of coal for the year 61,316,000 bushels represent arrivals by river and 22,627,000 bushels by rail, compared with 53,043,000 bushels by river and 25,719,000 bushels by rail in 1897, and 58,842,000 bushels by river and 20,847,000 bushels by rail in 1896. The varying condition of river navigation, as well as interruptions from labor disputes, have influence in changing the relation between river and rail receipts.

The shipments of coal from Cincinnati in 1898 were 14,221,000 bushels, and for five years, ending with 1897, the annual average of shipments was 17,760,000 bushels.

The local consumption of coal at Cincinnati in recent years for all purposes has been about 60,000,000 bushels annually, or moderately in excess of this quantity. Information obtained from dealers indicates some variation in sales relatively for household and steam or factory purposes, the general result indicating that the total is pretty evenly divided as to quantity for these uses. About 6 per cent of the local consumption is for production of gas.

Early in the past year the price of standard lump coal delivered to

consumers within usual distances was \$2.50 per ton of 2,000 pounds. In March this was changed to \$2.25, which prevailed until August, when a further reduction to \$2 was made. In October the \$2.25 price was restored, which continued to the close of the year. The average price for the year was \$2.25. For coal afloat in barges the price during the year ranged at 5 and 6 cents per bushel for Pittsburg, the quotation for Kanawha having a range of 4½ and 5½ cents, averaging 5.66 cents and 4.89 cents per bushel, respectively, or \$1.57 and \$1.36 per ton.

Statistics for years previous to 1891 were furnished by the former superintendent, Col. S. D. Maxwell. Prior to 1892 the statistics in the following table were collected for fiscal years ending August 31. The figures since 1892 are for calendar years. The receipts in 1891 from September 1 to December 31 are stated separately.

Receipts of coal at Cincinnati since September 1, 1871.

Year.	Pittsburg (Youghiogheny).	Kanawha, by river.	Ohio River.	Canal.
	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>
1871-72.....	19,254,716	.....	^a 10,359,906	1,104,003
1872-73.....	24,962,373	.....	^a 11,075,072	1,162,052
1873-74.....	24,014,681	.....	^a 10,398,153	710,000
1874-75.....	24,225,002	4,476,619	4,277,327	565,352
1875-76.....	27,017,592	6,004,675	4,400,792	409,358
1876-77.....	28,237,572	3,631,823	5,141,150	322,171
1877-78.....	26,743,055	6,386,623	3,288,008	380,768
1878-79.....	20,769,027	6,134,039	4,068,452	333,549
1879-80.....	31,750,968	8,912,801	4,268,214	202,489
1880-81.....	23,202,084	10,715,459	3,151,934	67,684
1881-82.....	37,807,961	13,950,802	3,560,881	77,336
1882-83.....	33,895,064	13,260,347	3,309,534	180,621
1883-84.....	32,239,473	15,926,743	2,956,688	293,010
1884-85.....	32,286,133	14,588,573	3,007,078	314,774
1885-86.....	34,933,542	17,329,349	939,746	205,717
1886-87.....	37,701,094	20,167,875	338,435	129,503
1887-88.....	41,180,713	20,926,596	1,533,358	26,098
1888-89.....	36,677,974	23,761,853	544,940	12,129
1889-90.....	42,601,615	19,221,196	454,385	.....
1890-91.....	43,254,460	19,115,172	1,479,670	15,111
1891, 4 months....	13,766,390	6,288,442	234,940	.....
1892 ^b	42,272,348	19,214,704	768,588	.....
1893.....	28,643,562	24,971,261	405,202	.....
1894.....	40,156,667	16,398,039	158,334	.....
1895.....	26,675,823	15,106,095	14,400	.....
1896.....	36,696,759	22,015,133	130,217	.....
1897.....	35,040,790	17,941,769	60,217	.....
1898.....	41,271,142	19,949,098	95,590	.....

^a Including Kanawha coal.

^b Calendar years since 1892.

Receipts of coal at Cincinnati since September 1, 1871—Continued.

Year.	Anthracite.	Other kinds.	Total.
	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>
1871-72.....	72, 171	.....	30, 790, 796
1872-73.....	75, 000	.....	37, 274, 497
1873-74.....	112, 000	.....	35, 234, 834
1874-75.....	248, 750	1, 597, 260	35, 890, 310
1875-76.....	282, 578	2, 068, 322	40, 183, 317
1876-77.....	376, 125	1, 913, 793	39, 622, 634
1877-78.....	439, 350	1, 654, 425	38, 892, 229
1878-79.....	768, 750	2, 136, 850	34, 210, 667
1879-80.....	712, 075	2, 351, 699	48, 198, 246
1880-81.....	770, 525	2, 336, 752	40, 244, 438
1881-82.....	779, 925	3, 090, 715	59, 267, 620
1882-83.....	977, 250	2, 997, 216	54, 620, 032
1883-84.....	1, 085, 350	3, 910, 795	56, 412, 059
1884-85.....	1, 257, 900	2, 683, 864	54, 138, 322
1885-86.....	1, 287, 925	2, 720, 250	57, 416, 529
1886-87.....	1, 314, 775	3, 693, 850	63, 345, 532
1887-88.....	1, 328, 225	5, 710, 649	70, 705, 639
1888-89.....	1, 020, 525	3, 075, 000	65, 092, 421
1889-90.....	1, 001, 175	4, 709, 775	67, 988, 146
1890-91.....	1, 118, 671	7, 362, 698	72, 345, 782
1891, 4 months.....	402, 528	4, 437, 139	25, 129, 439
1892 ^a	1, 268, 170	13, 335, 006	76, 858, 816
1893.....	759, 626	25, 832, 374	80, 612, 025
1894.....	661, 548	19, 083, 527	76, 458, 115
1895.....	1, 227, 000	27, 119, 823	70, 143, 141
1896.....	1, 171, 000	19, 676, 000	79, 689, 109
1897.....	1, 251, 250	24, 468, 000	78, 762, 026
1898.....	948, 125	21, 679, 000	83, 942, 955

^a Calendar years since 1892.

NOTE.—Since 1890-91 "other kinds" represent Kanawha coal largely; in 1898, 15,885,000 bushels, or 73 per cent. (See preceding table.)

The yearly range and average prices of Pittsburg coal, afloat and delivered, per bushel, based on weekly records, compare for ten years as shown in the following compilation:

Yearly range and average prices of Pittsburg coal at Cincinnati.

Year.	Afloat.			Delivered.		
	Lowest.	Highest.	Average.	Lowest.	Highest.	Average.
	<i>Cents.</i>	<i>Cents.</i>	<i>Cents.</i>	<i>Cents.</i>	<i>Cents.</i>	<i>Cents.</i>
1885-86.....	5½	8	6.58	9	11	10.05
1886-87.....	6½	15	7.55	9½	16	11.04
1887-88.....	7	18	10.01	10½	22	13.96
1888-89.....	6	8½	6.71	9	11½	9.95
1889-90.....	6	8	6.78	9	10½	9.69
1890-91.....	6½	8½	7.28	10	10½	10.24
1892.....	6½	8½	7.49	9	12½	10.36
1893.....	6½	8½	7.58	9	19½	11.04
1894.....	5½	9	6.34	7½	10½	9.11
1895.....	5½	6½	6.	8½	10½	9.
1896.....	5½	6	5.73	8½	9	8.21
1897.....	5½	5½	5.70	5½	10½	8.10
1898.....	5	6	5.66	6½	9	8.05

The bulk of coal from the Kanawha, Virginia and West Virginia regions sells at the same, or about the same, prices as are obtained for the product from the Pittsburg district.

The receipts of coke for the year were 2,888,000 bushels, and the quantity locally manufactured was 3,950,000 bushels, making a total of 6,838,000 bushels, compared with 7,748,000 bushels the preceding year. For city manufacture the average price for the year was 8.03 cents per bushel; of gas-house, 6.73 cents; of Connellsville, \$5.25 per ton.

ST. LOUIS, MISSOURI.

The following review of the coal trade of St. Louis for the year 1898 is furnished by Mr. James Cox, secretary of the Business Men's League of that city:

The number of bushels of bituminous coal received in St. Louis in 1898 was 83,562,450, about 170,000 less than in 1897, but considerably in excess of the average for the last five or six years. The year was an exceptionally good one in manufacturing, and reports from almost every line indicate the largest production for any year. The great bulk of the soft coal used for manufacturing purposes comes from the southern Illinois coal fields, and the labor difficulties therein retarded supplies considerably, with a result that nearly every factory for several

months was receiving coal almost every day instead of in large quantities at stated intervals. As a result, stocks on hand were very small, and so far as actual consumption is concerned, that of 1898 was much larger than for the preceding year.

The consumption of anthracite coal, on the other hand, showed a marked increase, the total being in excess of 225,000 tons, or more than 30 per cent in excess of the 1897 receipts. This is by far the largest consumption of anthracite coal in the city's history, and much satisfaction is felt in consequence. The crusade against smoke, which was so successful for two or three years, received a setback in consequence of a decision of the Missouri supreme court on a technical point, and as a result it has only been by an increased consumption of anthracite as compared with that of bituminous coal that the volume of smoke has been slightly curtailed. It may be mentioned in this connection that during the spring of 1899 the municipal assembly has passed another smoke-abating ordinance to conform with the opinion delivered by the supreme court. Legal opinion indicates that the new ordinance can be enforced without difficulty, and if cooperation can be obtained from large manufacturers, it is possible that the work which was so beneficial may be resumed and still better results accomplished. More than 1,700 smoke-creating boiler plants were equipped with abating devices during the campaign. Those establishments which regarded the matter as one of investment and put in devices which reduced the consumption of coal, increased the capacity of the boilers, and at the same time abated the smoke, are still using them and find them profitable.

One large factory states that the saving in coal every six months equals the cost of the devices. On the other hand, the very inexpensive devices which were used in hundreds of cases have long since been burned out and will have to be renewed entirely before a perceptible diminution in the volume of smoke can be accomplished. It is stated that some of the devices used with success in the East, but not yet tried west of the Mississippi River, will be introduced here this summer and fall, and the increased competition is likely to bring prices to a more satisfactory figure and induce further effort in the right direction.

The difficulty at times experienced in securing soft coal was also reflected in the demand for coke, of which 7,762,250 bushels of 40 pounds each were received, as compared with 5,671,000 in 1897. The popularity of coke for use in residences is responsible to a considerable extent for this increase, but not entirely.

Serious as were the labor difficulties in the southern Illinois coal fields in 1898, business was not materially hampered in St. Louis. The coal dealers, both wholesale and retail, were given a great deal of trouble, but they succeeded as a rule in keeping their customers fairly well supplied. The effect on prices was necessarily considerable, and the lowest figure for standard Illinois lump coal was \$1.30, 10 or 15

cents a ton higher than has usually been paid. At one time during the year the price ran as high as \$1.90, and the closing-figure of the year was \$1.35. An immense quantity of steam-producing coal was, however, sold at a very much lower figure than this, some contracts having been filled at but little in excess of \$1 per ton. Higher grades of bituminous coal sold from \$1.80 to \$2.30 per ton, which was an average of 30 or 40 cents a ton higher than has been the case in recent years. Anthracite, on the other hand, was cheaper, a considerable amount of business being done as low as \$5 a ton. Up to within the last two or three years \$6.25 or \$6.50 was regarded as a low figure. Best grades of coke were also lower, and there were large sales of Kentucky coke at \$2.90 per ton, a tempting figure to the consumer, and one which is said to leave absolutely no profit to the seller.

The Illinois Central Railway Company hauled more than 21,000,000 bushels of coal into St. Louis during the year, and the St. Louis, Peoria and Northern came second on the list with nearly 12,000,000 bushels, or more than twice as much as they delivered in 1897. The receipts from the Ohio River showed a trifling increase, but it is a singular coincidence that little advantage was taken by mine owners on the west side of the river of the labor troubles in Illinois. Instead of an increase in the receipts from roads entering the city from the west, as might naturally be expected, there was a considerable decrease, and Illinois came nearer than ever of enjoying a monopoly of the St. Louis coal trade.

The following quotations show the range of prices during the year, the figures in each case being free on board at St. Louis:

Coal prices at St. Louis, Missouri, during 1898.

Kind.	Highest.	Lowest.	Closing.
Standard Illinois lump coal.....	\$1.90	\$1.30	\$1.35
High-grade Illinois lump coal.....	2.30	1.80	1.92½
Anthracite, large.....	5.90	5.00	5.05
Anthracite, small.....	6.15	5.25	5.30
Connellsville coke.....	4.60	4.30	4.30
New River coke.....	4.05	3.80	4.05
Indiana coke.....	3.40	3.20	3.30
Kentucky coke.....	3.05	2.90	3.05
Gas coke.....	3.25	3.25	3.25

The following table shows the receipts of coal and coke at St. Louis during the present decade:

Coal and coke receipts at St. Louis since 1890.

Year.	Soft coal.	Hard coal.	Coke.
	<i>Bushels.</i>	<i>Tons.</i>	<i>Bushels.</i>
1890.....	69,477,225	124,335	9,919,850
1891.....	72,078,225	139,050	6,924,250
1892.....	82,302,228	187,327	8,914,400
1893.....	87,769,375	173,653	7,807,000
1894.....	74,644,375	186,494	6,365,900
1895.....	88,589,935	207,784	7,130,300
1896.....	87,677,600	218,955	5,395,900
1897.....	83,730,980	172,933	5,671,350
1898.....	83,562,450	225,616	7,762,250

MOBILE, ALABAMA.

Mr. Edward E. England, secretary of the Chamber of Commerce, has prepared the following review of the coal trade at that port:

The receipts for a series of years have been as follows:

Receipts of coal at Mobile, Alabama, since 1883.

Year.	Alabama coal. (a)	Anthracite and English.	Total.
	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>
1883.....	25,304	1,229	26,533
1884.....	17,808	891	18,699
1885.....	40,301	775	41,076
1886.....	30,310	2,022	32,332
1887.....	39,232	910	40,142
1888.....	38,785	648	39,433
1889.....	43,620	1,454	45,074
1890.....	39,320	1,327	40,647
1891.....	51,267	1,775	53,042
1892.....	70,298	1,500	71,798
1893.....	90,000	4,130	94,130
1894.....	104,340	3,600	107,940
1895.....	156,996	4,200	161,196
1896.....	165,000	3,000	168,000
1897.....	^b 175,160	1,600	176,760
1898.....	122,500	4,425	126,925

^a This does not include the amount of coal used by the railroads on their locomotives and at their shops.
^b Includes 3,000 tons received by barges via Tombigbee River.

The past season has not been a satisfactory one for Mobile. While there has been more coal mined in the State than ever before, the amount handled in Mobile has been less than last year.

This has been brought about largely by the renewed prosperity of the country. Alabama is an iron-manufacturing State, and much of the coal mined in Alabama is used for making coke for iron manufacturing purposes. The great increase in the demand for iron caused all the furnaces in the State to start up, and this has brought about a great demand for coke. The railroads also had an increased business thrown to them, and they required more coal, and there were many manufacturing plants built through the interior of the South in sections tributary to the Alabama coal mines. These required coal, and so, early last fall, the demand for coal on the Alabama mines began to be greater than the supply, and this increased all through the winter, which was an unusually cold one, and the increased demand caused an advance in prices at the mines; in fact for several months during the past winter it was impossible to get a supply of coal at any price.

As Mobile's coal business consists largely in supplying ships with bunker coal, the scarcity of coal and the advance in the price prevented some ships taking bunker coal here in as large quantities as they would have done. In fact, in a few cases ships that came here found they could not get a supply promptly, and went away without taking coal here in view of calling at Hampton Roads for their supply.

This shortage in the supply of coal and the increase in price has brought about the opening of several new mines in north Alabama, and as the supply is now steadily increasing, it is thought there will be no difficulty about a supply hereafter; but the mines have advanced their prices three times within the last few months, as they have advanced the pay of the miners and laborers, so that coal is now higher here than heretofore, and until this is changed it will have a tendency to reduce the amount of coal called for at this port.

Contracts for over 200,000 tons of coal for export have been declined by parties here on account of inability of Alabama mines to furnish it.

NORFOLK, VIRGINIA.

Col. William Lamb, of the firm of William Lamb & Co., agents for Pocahontas coal at Norfolk, Virginia, makes the following comments on the coal trade of that city:

The Pocahontas coal trade of last year was in some respects a remarkable one. The war with Spain, while decreasing the coastwise business on account of placing torpedoes in the channel from Chesapeake Bay to Hampton Roads and the fear of coastwise vessels of Spanish cruisers, putting freights up so high as to prevent the filling of many orders from the Northern and Southern coastwise ports, largely

increased the trade on account of the Navy Department using Pocahontas coal as the standard coal of the Navy and purchasing about 150,000 tons for the men-of-war and colliers and for shipment to Key West, Guantanamo, Porto Rico, Manila, and Honolulu. At one time during the war there was 40,000 tons of Pocahontas coal afloat in Hampton Roads in Government colliers waiting for orders.

Besides this addition to the Pocahontas trade on account of hostilities with Spain, the strike in the coal mines of Wales, together with the reputation of the coal, caused many foreign orders to be sent for it, among them orders from the British Admiralty for shipment to Bermuda, and from mercantile houses for shipment to Algoa Bay, Cape Town, and St. Paul de Loanda, Africa; to Rio de Janeiro, Buenos Ayres, Montevideo, and La Plata, South America; to Singapore, Naples, St. Michaels, Azores; Port Praya, Cape Verde Islands; Las Palmas, Canary Islands; St. Lucia and Kingston, West Indies; Valparaiso, Chile, and other foreign ports, including a large cargo to London, England.

These shipments were certainly unprecedented in the history of American coal. It was sending it to all parts of the globe.

Notwithstanding the loss of the coastwise business, the total movement in 1898 over 1897 was more than 150,000 tons.

Pocahontas coal shipments from Lamberts Point piers since 1890.

Year.	Foreign.	Bunkers.	Coastwise.	Local.	Total.
	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>
1890.....	37,723	102,755	941,019	71,010	1,152,507
1891.....	27,997	135,112	1,215,028	90,606	1,468,743
1892.....	25,653	129,627	1,400,984	98,034	1,654,298
1893.....	34,969	125,688	1,512,931	100,453	1,774,041
1894.....	44,328	105,382	1,810,480	96,841	2,057,031
1895.....	34,174	75,714	1,430,144	100,442	1,640,474
1896.....	41,600	99,867	1,433,069	96,929	1,671,465
1897.....	44,103	104,966	1,473,710	115,079	1,737,858
1898.....	200,283	107,154	1,450,943	131,422	1,889,802

Besides the Pocahontas coal, there was shipped by the Norfolk and Western Railway 97,710 tons of coal, mostly from Toms Creek.

SAN FRANCISCO, CALIFORNIA.

Mr. J. W. Harrison, in his annual report to the coal trade of San Francisco, says:

The fuel consumption of California in 1898 showed a slight increase over 1897, which demonstrates that our manufactories have done a fairly good business, although the high prices ruling for coal all through-

out 1898 must have minimized profits. When it is figured out that all our industrials are handicapped by paying locally over \$4 per ton for fuel in excess of Eastern competitors, it can readily be ascertained why our factories are so few and small, and why so much machinery and structural iron and steel are arriving here daily from the East.

The ruling prices for coal this year have been from 15 to 20 per cent in excess of last. This has been mainly attributable to our crop failure, as, having comparatively no wheat to export, there has been a sparsity of grain carriers seeking our port, and in consequence but little foreign coal has been delivered here. The northern collieries have been our main sources of supply. Without foreign shipments they have had our local markets entirely under their control, and have regulated prices accordingly. Hence this has proved a most profitable year for colliery proprietors in British Columbia and Washington. It is uncertain how our market will shape itself for 1899. It mainly depends upon our cereal harvest, as a liberal rainfall means a bounteous harvest, that will insure us an influx of tonnage to move our wheat, and the incoming vessels will deliver to us large quantities of foreign coals. At present we are somewhat discouraged, as our rainfall is considerably below the average.

The following table of prices will show the monthly fluctuations of foreign coals for "spot" cargoes. The average price is given for each month.

	Jan.	Feb.	Mar.	Apr.	May.	June.
Australian (gas).....	\$6.25	\$6.35	\$6.50	\$6.60	\$6.75	\$7.00
English steam.....	6.75	6.75	7.00	7.00	7.25	7.50
Scotch splint.....	7.25	7.25	7.25	7.25	7.50	7.75
West Hartley.....	7.50	7.50	7.50	7.50	7.75	8.00
	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Australian (gas).....	\$7.25	\$7.50	\$7.25	\$7.25	\$7.15	\$7.00
English steam.....	7.50	7.50	7.50	7.50	7.50	7.25
Scotch splint.....	7.75	7.75	7.75	7.75	7.75	7.50
West Hartley.....	8.00	8.00	8.00	8.00	8.00	8.00

The various sources from which we have derived our supplies are as follows:

Sources of coal consumed in California.

Source.	1890.	1891.	1892.	1893.
	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>
British Columbia.....	441,759	652,657	554,600	588,527
Australia.....	194,725	321,197	314,280	202,017
English and Welsh	35,662	168,586	210,660	151,269
Scotch	1,610	31,840	24,900	18,809
Eastern (Cumberland and anthracite)	32,550	42,210	35,720	18,960
Franklin, Green River, and Cedar River.....	216,760	178,230	164,930	167,550
Carbon Hill and South Prairie	191,109	196,750	218,390	261,435
Mount Diablo and Coos Bay	74,210	90,684	66,150	63,460
Japan, etc.....	13,170	20,679	4,220	7,758
Total	1,201,555	1,702,833	1,593,850	1,479,785

Source.	1894.	1895.	1896.	1897.	1898.
	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>
British Columbia.....	647,110	651,295	551,852	558,372	651,208
Australia.....	211,733	268,960	273,851	281,666	201,931
English and Welsh	157,562	201,180	156,368	107,969	75,115
Scotch	18,636	4,098	8,356	4,081	5,056
Eastern (Cumberland and anthracite).....	16,640	26,863	17,907	21,335	37,560
Seattle (Franklin, Green River, etc.).....	153,199	150,888	128,919	220,175	283,963
Carbon Hill, South Prai- rie, etc	241,974	256,267	255,923	286,205	348,474
Mount Diablo and Coos Bay	65,263	84,954	110,237	115,150	172,506
Japan, Alaska, etc.....	15,637	9,015	2,247	6,587	26,560
Total	1,527,754	1,653,520	1,505,660	1,601,540	1,802,373

As it is necessary to include deliveries at Port Los Angeles and at San Diego to arrive at an accurate statement of the consumption of coal in the State, these are added in the above sources of supply. The total amount received by water at these two points aggregated 155,238 tons in 1897 and 154,402 tons in 1898.

Coke.—The total deliveries of 1898 were 41,630 tons, against 30,320 tons in 1897. Of the deliveries, over one-half were shipped from Eng-

land, the remainder coming from Belgium, British Columbia, and Australia.

SEATTLE, WASHINGTON.

Mr. Lovett M. Wood, editor of the Trade Register, reports as follows on the coal trade at Seattle:

Seattle has been in years past and will undoubtedly continue to be the leading coal port of the State. There are two reasons for this: First, King County mines have a much larger output than those of any other county in the State. Seattle being the largest city in the State, having a population at present of about 75,000, its local needs and commerce and its superior rail and water facilities naturally draw the coal outputs to this city. Secondly, as San Francisco is the chief market for coast coals, and as the city at the Golden Gate has larger trade relations with Seattle than with any other point on the Pacific coast, shipments are naturally increasing from this port, and the mines of other counties are looking to Seattle for facilities with which to market their outputs. Two new mines of large extent are being opened in King County, one of which is asking a franchise to build a standard-gage railroad from the mine to Seattle. Both will export largely to San Francisco. The increased foreign shipping from Seattle makes greater demands on the coal shipped to this port, and the prospect of commerce with the far east in the near future is no doubt influencing the capitalists who are opening up the new mines in this State, the coal areas of which have only begun to be developed.

The accompanying table of receipts and exports by months at Seattle, eliminates a small tonnage from mines that supply the owners' industries exclusively. The Trade Register has kept monthly records since 1893, but has been unable to get any definite record of the exports to give with the receipts of 1889 to 1892, which are shown in a subsequent table.

During 1898 nine mines shipped their outputs to Seattle, the record for the year ending December 31 being:

Shipments of coal from the mines to Seattle in 1898.

Mine.	Tons.
Issaquah Coal Co.....	111,200
Black Diamond.....	144,176
Newcastle.....	153,204
Franklin.....	165,315
Renton Cooperative Co.....	35,650
Cedar Mountain.....	14,875
Sunset Coal Co.....	930
Danville Coal Co.....	699
Over Northern Pacific R. R.....	52,291
Total.....	678,340

The Sunset and Danville mines only began shipping in October, the above record being only for two months for these mines. This, with the omission of the Northern Pacific Railroad receipts in the monthly table, shows a disparity of 3,770 tons in the totals of the year. In addition to the above showing, Seattle received 6,048 tons of foreign coal in 1898, chiefly for blacksmithing.

Receipts and exports of coal at Seattle, Washington, in 1898, by months.

Month.	Receipts.	Exports.
	<i>Tons.</i>	<i>Tons.</i>
January	55,519	32,229
February	48,386	21,427
March	57,000	33,054
April	51,410	23,037
May	51,714	36,858
June	45,287	35,605
July	42,176	28,285
August	47,743	35,282
September	50,945	33,210
October	51,050	38,935
November	59,258	32,540
December	61,796	28,116
Total 1898	622,284	378,578
Total 1897	472,311	287,883
Increase in 1898	149,973	90,695

The total receipts and exports for a series of years at Seattle were as follows:

Coal receipts at Seattle, Washington, 1889 to 1898.

Year.	Receipts.	Exports.
	<i>Tons.</i>	<i>Tons.</i>
1889	369,198	.....
1890	487,215	.....
1891	421,587	.....
1892	416,174	.....
1893	461,034	342,114
1894	437,939	318,670
1895	363,979	257,739
1896	425,103	194,771
1897	472,311	287,883
1898	622,284	378,578

PRODUCTION OF COAL BY STATES.

There were thirty States which contributed to the coal product of the United States in 1898. Among these Pennsylvania stands first, with a total product which has for twenty years been equivalent to more than 50 per cent of the total coal product of the United States. Pennsylvania's average proportion of the total product for this entire period has been 55 per cent. The lowest percentage contributed by Pennsylvania was 52 in 1884 and 1888, while in 1880 it was 65. With such a record and the fact that within the borders of the Pennsylvania line are the anthracite fields which yielded about 25 per cent of the total product, it is very improbable that Pennsylvania will ever be supplanted as the most important coal producer in the United States. Next in importance to Pennsylvania is Illinois, whose product in 1898 was about 9 per cent of the total, while West Virginia, third in importance, contributed in 1898 about 8 per cent of the total. Ohio, fourth, produced about 7 per cent. Next in importance comes Alabama, with a total in 1898 of 6,535,283 short tons, equivalent to about 3 per cent of the total. It will be observed that all of these five leading States are east of the Mississippi River, and all but one, Illinois, are included in the Appalachian system. Among the States west of the Mississippi River Iowa stands first, with a total production in 1898 of 4,618,842 short tons. Indiana, however, in the central field, and Maryland, in the Appalachian, were both larger producers in 1898 than Iowa. While Iowa leads in the production west of the Mississippi River, it stood eighth among all the coal-producing States. Colorado, the second in production west of the Mississippi and first among the Rocky Mountain States, occupies ninth place in the rank of coal producers. It will be seen by this that only two of the ten leading States—Iowa and Colorado—are west of the Mississippi River. Using the Mississippi River as the dividing line between the Eastern and Western States, it is found that the production of the States east of the river in 1898 amounted to 193,793,334 short tons, while those west of the river produced a total of 26,181,333 short tons. Dividing again the Eastern States by the Ohio and Potomac rivers, the production of the States on the north of that line is shown to have been 161,575,292 short tons, while the Southern States contributed 32,218,042 short tons to the product of last year. Excluding the anthracite production in Pennsylvania, the total bituminous product of the Northern States amounted to 108,192,648 short tons, against the 32,218,042 short tons in the Southern States and the 26,181,333 short tons in the Western States. The percentage of the total product from these sections in 1898 was: Northern States, 64.95; Southern States, 19.33; Western States, 15.72. The production in the several States in 1898 and previous years is discussed with more detail in the following pages.

ALABAMA.

Total product in 1898, 6,535,283 short tons; spot value, \$4,932,776.

Alabama's coal product in 1898 exceeded that of 1897 by 642,000 short tons, or a little over 11 per cent. The value of the product, however, instead of showing a corresponding increase, was \$248,953 less than that of the previous year. Had the same prices prevailed in 1898 as in 1897 the value of the larger product in 1898 would have amounted to about \$5,765,000, so that the actual loss in value (difference in tonnage considered) was about \$820,000. Bibb and Jefferson counties were responsible for the greater part of the decrease in value, the average price in the former declining from 93 cents to 86 cents and in the latter from 88 cents to 69 cents. The principal reason for the decline in Jefferson County seems to be in the value placed upon the coal charged into the coking ovens, although there was a general decline in the price of coal marketed.

The amount of coal mined by machines in 1898 was 298,170 short tons, against 294,384 tons in 1897, the increase being in spite of the fact that one company using 5 machines in 1897 did not operate them in 1898, and another company which used 12 machines the year before operated only 9 in 1898, so that the total number of machines in use decreased from 45 to 37. The number of men employed in the Alabama coal mines increased about 1 per cent, from 10,597 to 10,733, compared with an 11 per cent increase in product, the difference being accounted for by an increase of 17 days in the average working time. The average tonnage per man per day in 1898 was 2.44, against 2.38 in 1897 and 2.34 in 1896.

As in 1897, operators of coal mines in Alabama were not seriously affected by labor troubles. There were eight mines in which strikes occurred in 1898, the same number being affected the previous year. The longest strike occurred at the Mary Lee mine in Jefferson County, where 85 men were out from July 1 to October 1. Two strikes occurred at the Hargrove mine in Bibb County, 125 men being out from March 28 to April 10, and from July 1 to July 19. At the Mabel mine, in Jefferson County, 150 men were on strike from October 1 to October 31. A ten days' strike occurred at the Bessemer mines, Bibb County; one of eight days at Thomas mine, Jefferson County; one of six days at DeBernier mine, Jefferson County; one of five days at Santee mine, Shelby County, and one of twelve days at Galloway No. 4, Walker County.

In considering the distribution of the product for consumption as presented in the following tables, allowance must be made for the fact that a considerable portion of the product included in the shipments is made into coke at ovens located at points distant from the mines. The total amount of coal consumed in the manufacture of coke in Alabama in 1897 was 2,451,475 tons, and in 1898 2,814,615 tons.

COAL.

395

Coal product of Alabama in 1897, by counties.

County.	Num- ber of mines.	Loaded at mines for ship- ment.	Sold to local trade and used by em- ployees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Aver- age price per ton.	Aver- age num- ber of days active.	Aver- age num- ber of employ- ees.
		Short tons.	Short tons.	Short tons.	Short tons.	Short tons.				
Bibb.....	5	637, 230	1, 950	21, 165	10, 732	671, 077	\$622, 566	\$0.93	183	1, 425
Blount.....	2	40, 168	350			40, 518	44, 253	1.09	254	61
Etowah.....	35	2, 645, 107	29, 773	74, 902	964, 894	3, 714, 676	3, 266, 217	.88	250	6, 026
Jefferson....	2	63, 104	693	3, 787		67, 584	54, 997	.81	270	166
St. Clair....	7	68, 131	270	2, 650	13, 622	84, 673	127, 137	1.50	179	376
Shelby.....	5	128, 525	5, 772	4, 243	97, 948	234, 488	218, 545	.93	276	425
Tuscaloosa..	20	955, 104	12, 972	19, 440	50, 000	1, 037, 516	815, 617	.79	219	2, 089
Walker.....	2	8, 228	10			8, 238	7, 753	.94	212	29
Winston.....			35, 000			35, 000	35, 000	1.00		
Small mines..										
Total.....	78	4, 543, 597	86, 790	126, 187	1, 137, 196	5, 893, 770	5, 192, 085	.88	233	10, 597

Coal product of Alabama in 1898, by counties.

County.	Num- ber of mines.	Loaded at mines for ship- ment.	Sold to local trade and used by em- ployees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Aver- age price per ton.	Aver- age num- ber of days active.	Aver- age num- ber of employ- ees.
		Short tons.	Short tons.	Short tons.	Short tons.	Short tons.				
Bibb.....	4	771, 264	2, 992	27, 437	9, 188	810, 891	\$701, 049	\$0.86	257	1, 104
Blount and Cullman..	2	15, 600	2, 700			18, 300	19, 626	1.07	230	44
Etowah.....	2	4, 384	1, 500			5, 884	6, 259	1.06	166	21
Jefferson....	31	2, 834, 360	44, 098	84, 762	1, 241, 370	4, 204, 590	2, 921, 411	.69	257	6, 484
St. Clair....	2	69, 361	604	2, 843		72, 808	52, 196	.72	252	155
Shelby.....	7	63, 361	3, 995	1, 631		68, 987	120, 026	1.74	222	299
Tuscaloosa..	10	140, 782	11, 099	4, 450	82, 623	238, 954	215, 467	.90	253	598
Walker.....	21	1, 020, 647	4, 122	24, 685	21, 880	1, 071, 334	854, 380	.80	226	2, 007
Winston.....	3	7, 069	1, 466			8, 535	7, 412	.87	212	21
Small and unreport- ed mines..			35, 000			35, 000	35, 000			
Total.....	82	4, 926, 828	107, 576	145, 808	1, 355, 071	6, 535, 283	4, 932, 776	.75	250	10, 738

Distribution of the coal product of Alabama from 1889 to 1898.

Year.	Num- ber of mines.	Loaded at mines for ship- ment.	Sold to local trade and used by em- ployees	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Aver- age price per ton.	Aver- age num- ber of days active.	Average number of em- ployees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
1889..		2,327,209	59,945	79,515	1,106,314	3,572,983	\$3,961,491	\$1.10	.....	6,975
1890..		2,487,983	84,578	88,952	1,428,896	4,090,409	4,202,469	1.03	217	10,001
1891..		2,882,813	91,456	100,160	1,745,352	4,759,781	5,087,596	1.07	268	9,302
1892..		3,122,075	37,843	135,627	2,233,767	5,529,312	5,788,898	1.05	271	10,075
1893..		3,536,935	59,599	96,412	1,443,989	5,136,935	5,096,792	.99	237	11,294
1894..		3,269,548	43,911	130,404	953,315	4,397,178	4,085,535	.93	238	10,889
1895..	64	3,610,433	272,551	137,021	1,673,770	5,693,775	5,126,822	.90	244	10,346
1896..	80	3,555,493	285,416	138,268	1,769,520	5,748,697	5,174,135	.90	248	9,894
1897..	78	4,543,597	86,790	126,187	1,137,196	5,893,770	5,192,085	.88	233	10,597
1898..	82	4,926,828	107,576	145,808	1,355,071	6,535,283	4,932,776	.75	250	10,738

Coal product of Alabama since 1895, by counties.

County.	1895.	1896.	1897.	1898.	Increase, 1898.	Decrease, 1898.
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
Bibb	653,732	710,842	671,077	810,891	139,814	.....
Blount	62,400	32,760	37,350	18,300	.....	19,050
Cullman		1,000				
Etowah	900	3,080	3,168	5,884	2,716	.....
Jefferson	3,726,325	3,729,719	3,714,676	4,204,590	489,914	.....
St. Clair	30,806	33,368	67,584	72,808	5,224	.....
Shelby	52,754	52,923	84,673	68,987	.....	15,686
Tuscaloosa	208,117	205,223	234,488	238,954	4,466	.....
Walker	946,241	952,642	1,037,516	1,071,334	33,818	.....
Winston	4,500	2,140	8,238	8,535	297	.....
Small mines	8,000	25,000	35,000	35,000	.....	.....
Total	5,693,775	5,748,697	5,893,770	6,535,283	641,513	.....

The county distribution of the coal product of Alabama since 1889 will be found in the report for 1897.

The following table shows the annual output of coal in the State since 1870, with the exception of 1871 and 1872, for which no statistics were obtained:

Annual coal product of Alabama since 1870.

Year.	Short tons.	Value.	Average price per ton.	Average number of days worked.	Average number of employees.
1870.....	13, 200				
1873.....	44, 800				
1874.....	50, 400				
1875.....	67, 200				
1876.....	112, 000				
1877.....	196, 000				
1878.....	224, 000				
1879.....	280, 000				
1880.....	380, 800				
1881.....	420, 000				
1882.....	896, 000				
1883.....	1, 568, 000				
1884.....	2, 240, 000				
1885.....	2, 492, 000				
1886.....	1, 800, 000	\$2, 574, 000	\$1. 43		
1887.....	1, 950, 000	2, 535, 000	1. 30		
1888.....	2, 900, 000	3, 335, 000	1. 15		
1889.....	3, 572, 983	3, 961, 491	1. 10	248	6, 975
1890.....	4, 090, 409	4, 202, 469	1. 03	217	10, 642
1891.....	4, 759, 781	5, 087, 596	1. 07	268	9, 302
1892.....	5, 529, 312	5, 788, 898	1. 05	271	10, 075
1893.....	5, 136, 935	5, 096, 792	. 99	237	11, 294
1894.....	4, 397, 178	4, 085, 535	. 93	238	10, 859
1895.....	5, 693, 775	5, 128, 822	. 90	244	10, 346
1896.....	5, 748, 697	5, 174, 135	. 90	248	9, 894
1897.....	5, 893, 770	5, 192, 085	. 88	233	10, 597
1898.....	6, 535, 283	4, 932, 776	. 75	250	10, 733

ARKANSAS.

Total product in 1898, 1,205,479 short tons; spot value, \$1,238,778.

Arkansas stands almost alone among the coal-producing States in the proportion of increased production in 1898 as compared with 1897 or immediately preceding years. The product jumped from 856,190 tons in 1897 to 1,205,479 short tons in 1898, bringing Arkansas into the list of States producing over a million tons of coal a year. The increase over 1897 amounted to 349,289 short tons, or a little over 40 per cent, a rate equaled only by two other States, California and Michigan. In both of these cases, however, the amount of increase was small compared with that of Arkansas. Michigan's total product was less than the increase in Arkansas's product in 1898 over 1897. This increase was also 2.4 times the total product of California in 1898.

The production in 1898 showed an increase of nearly 80 per cent as compared with that of 1896, and was a little more than double than of 1895. With such a phenomenal increase in tonnage the slight decline of 3 cents per ton in the average price was insignificant; for, notwithstanding this decline the total value increased nearly \$335,000, or approximately \$1 per ton on the increased product. Moreover, the number of undercutting machines increased from 15 to 21 and the machine-mined product from 87,532 short tons to 152,192 short tons, and it is probable that some of the lower selling price was due to and compensated for by a reduced cost of mining. Another evidence of reduced cost of production is shown in the productive capacity for each man employed. The average tonnage won per man per day in 1898 was 2.90, against 2.75 in 1897 and 2.66 in 1896.

Only one strike was reported in the State during 1898. It lasted but five days, during which time 514 men employed at mines Nos. 15, 16, and 17 of the Western Coal and Mining Company in Sebastian County were idle. A strike of a week's duration occurred at the same mines and at the same season (October) in 1897, but in each case the duration was so short that no material influence was felt in the production.

The statistics of production in 1897 and 1898, with the distribution of the product for consumption, are presented in the following tables:

Coal product of Arkansas in 1897, by counties.

County.	Num- ber of mines.	Loaded at mines for ship- ment.	Sold to local trade and used by em- ployees.	Used at mines for steam and heat.	Total product.	Total value.	Aver- age price per ton.	Aver- age num- ber of days active.	Average number of em- ployees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Franklin	2	162,307	260	1,730	164,297	\$182,864	\$1.11	154	380
Johnson	3	107,752	4,250	6,000	117,002	178,082	1.52	131	405
Pope									
Sebastian	9	557,459	1,078	10,354	568,891	531,047	.93	165	1,205
Small mines			6,000		6,000	12,000	2.00		
Total	14	827,518	11,588	18,084	856,190	903,993	1.06	156	1,990

Coal product of Arkansas in 1898, by counties.

County.	Num- ber of mines.	Loaded at mines for ship- ment.	Sold to local trade and used by em- ployees.	Used at mines for steam and heat.	Total product.	Total value.	Aver- age price per ton.	Aver- age num- ber of days active.	Average number of em- ployees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Franklin	7	318,842	1,435	8,135	328,412	\$397,933	\$1.21	127	892
Johnson									
Pope									
Sebastian	10	848,261	5,821	16,985	871,067	828,845	.95	182	1,663
Small mines			6,000		6,000	12,000	2.00		
Total	17	1,167,103	13,256	25,120	1,205,479	1,238,778	1.03	163	2,555

Distribution of the coal product of Arkansas from 1889 to 1898.

Year.	Num- ber of mines.	Loaded at mines for ship- ment.	Sold to local trade and used by em- ployees.	Used at mines for steam and heat.	Total product.	Total value.	Aver- age price per ton.	Aver- age num- ber of days active.	Average number of em- ployees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
1889		268,518	6,820	4,246	279,584	\$395,836	\$1.42	.....	677
1890		374,969	9,240	15,679	399,888	514,595	1.29	214	938
1891		518,120	8,909	15,350	542,379	647,560	1.19	214	1,317
1892		513,908	7,450	14,200	535,558	666,230	1.24	199	1,128
1893		549,504	11,778	18,481	574,763	773,347	1.34	151	1,559
1894	13	488,077	7,870	16,679	512,626	631,988	1.22	134	1,493
1895	13	576,112	14,935	7,275	598,322	751,156	1.25	176	1,218
1896	14	647,240	8,640	19,494	675,374	755,577	1.12	168	1,507
1897	14	827,518	11,588	18,064	856,190	903,993	1.06	156	1,990
1898	17	1,167,103	13,256	25,120	1,205,479	1,238,778	1.03	163	2,555

According to the Tenth United States Census, the coal product of Arkansas in 1880 was 14,778 short tons, valued at \$33,535. No statistics were obtained in 1881. With this exception the statistics of production since 1880 have been as follows:

Annual production of coal in Arkansas since 1880.

Year.	Short tons.	Value.	Average price per ton.	Average number of days worked.	Average number of employees.
1880	14,778	\$33,535	.....	.....	.....
1882	5,000	.....	.....	.....	.....
1883	50,000	.....	.....	.....	.....
1884	75,000	.....	.....	.....	.....
1885	100,000	.....	.....	.....	.....
1886	125,000	200,000	\$1.60	.....	.....
1887	129,600	194,400	1.50	.....	.....
1888	276,871	415,306	1.50	.....	978
1889	279,584	395,836	1.42	.....	677
1890	399,888	514,595	1.29	214	938
1891	542,379	647,560	1.19	214	1,317
1892	535,558	666,230	1.24	199	1,128
1893	574,763	773,347	1.34	151	1,559
1894	512,626	631,988	1.22	134	1,493
1895	598,322	751,156	1.25	176	1,218
1896	675,374	755,577	1.12	168	1,507
1897	856,190	903,993	1.06	156	1,990
1898	1,205,479	1,238,778	1.03	163	2,555

The production by counties during the last four years is shown in the following table. The county distribution in earlier years will be found in the report for 1897:

Coal product of Arkansas since 1895, by counties.

County.	1895.	1896.	1897.	1898.	Increase in 1898.
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
Franklin	252, 938	222, 711	281, 299	328, 412	47, 113
Johnson					
Pope					
Sebastian	339, 384	446, 663	568, 891	871, 067	302, 176
Small mines	6, 000	6, 000	6, 000	6, 000	.....
Total	598, 322	675, 374	856, 190	1, 205, 479	349, 289

CALIFORNIA.

Total product in 1898, 144,288 short tons; spot value, \$349,915.

The increased activity in the coal mines of California shown in the statistics of production in 1897 continued with augmented energy in 1898, the product increasing nearly 60,000 tons, or about 70 per cent, over 1897, nearly doubling that of 1896, and reaching the largest total ever reported in the history of the State. In addition to this, there was an advance in the average price obtained from \$2.34 per ton, in 1897, to \$2.43, in 1898, making a total increase in value of \$148,679, or 74 per cent, as compared with a 70 per cent increase in tonnage.

Three influences combined to produce this effect: (1) The industrial revival; (2) the increased tariff on foreign coal, and (3) higher prices for imported fuel, due to a short wheat crop in the State and vessels bringing in coal had no return cargo, so that freight rates were advanced.

There were no strikes or other disturbing elements in the industry during 1898. All of the product is mined by hand, no machines having been introduced into California mines.

The following tables exhibit the details of production in 1897 and 1898:

Coal product of California in 1897, by counties.

County.	Num- ber of mines.	Loaded at mines for ship- ment.	Sold to local trade and used by em- ployees.	Used at mines for steam and heat.	Total product.	Total value.	Aver- age price per ton.	Aver- age num- ber of days active.	Average number of em- ployees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Alameda.....	2	33, 900	2, 000	1, 000	36, 900	\$77, 870	\$2. 11	67	212
Amador									
Contra Costa...	2	37, 482	1, 087	3, 356	41, 905	103, 011	2. 68	269	130
Kern	3	3, 400	3, 782	5	7, 187	20, 355	2. 83	253	21
Orange									
San Diego.....									
Total	7	74, 762	6, 869	4, 361	85, 992	201, 236	2. 34	150	363

Coal product of California in 1898, by counties.

County.	Number of mines.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Total product.	Total value.	Average price per ton.	Average number of days active.	Average number of employees.
Alameda and Alameda	2	Short tons. 77,000	Short tons. 13,200	Short tons.	Short tons. 90,200	\$205,600	\$2.28	292	145
Contra Costa, Kern, Orange, and Riverside	4	46,568	2,796	4,724	54,088	144,315	2.67	238	139
Total	6	123,568	15,996	4,724	144,288	349,915	2.43	265	284

Distribution of the coal product of California from 1889 to 1898.

Year.	Number of mines.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Total product.	Total value.	Average price per ton.	Average number of days active.	Average number of employees.
		Short tons.	Short tons.	Short tons.	Short tons.				
1889		111,128	3,146	7,546	121,820	\$288,232	\$2.37		
1890		103,436	2,121	5,154	110,711	283,019	2.56	301	364
1891		86,783	3,424	3,094	93,301	204,902	2.20	222	256
1892		73,269	9,679	2,230	85,178	209,711	2.46	204	187
1893		64,733	5,336	2,534	72,603	167,555	2.31	208	158
1894	6	52,736	8,143	6,368	67,247	155,620	2.31	232	125
1895	5	60,440	12,171	2,842	75,453	175,778	2.33	262	190
1896	4	69,608	4,537	4,399	78,544	166,123	2.12	297	157
1897	7	74,762	6,869	4,361	85,992	201,236	2.34	150	363
1898	6	123,568	15,996	4,724	144,288	349,915	2.43	265	284

The following table shows the total output of California since 1883, with the value, when it has been reported, and the statistics of the number of employees and the average working time during the past nine years:

Coal product of California since 1883.

Year.	Short tons.	Value.	Average price per ton.	Average number of days active.	Average number of employees.
1883	76,162				
1884	77,485				
1885	71,615				
1886	100,000	\$300,000	\$3.00		
1887	50,000	150,000	3.00		
1888	95,000	380,000	4.00		
1889	121,820	288,232	2.36		
1890	110,711	283,019	2.56	301	364
1891	93,301	204,902	2.20	222	256
1892	85,178	209,711	2.46	204	187
1893	72,603	167,555	2.31	208	158
1894	67,247	155,620	2.31	232	125
1895	75,453	175,778	2.33	262	190
1896	78,544	166,123	2.12	297	157
1897	85,992	201,236	2.34	150	363
1898	144,288	349,915	2.43	265	284

COLORADO.

Total product in 1898, 4,076,347 short tons; spot value, \$4,686,081

Although the coal product of Colorado in 1898 exceeded that of 1897 by 714,644 short tons, or about 21 per cent, it was about 26,000 tons less than that of 1893, the banner year of coal mining in the State. With this one exception, however, the output in 1898 was the largest on record. The value of the product in 1898 was \$738,895 more than that of 1897. The average price per ton declined from \$1.17 to \$1.15.

One of the most striking features of the coal-mining industry in Colorado in 1898 is exhibited in the statistics of the coal mined by machines. These show that while the number of machines increased from 37 to 43, a gain of 6, the machine-mined product decreased from 352,400 tons to 225,646 tons. This was due to the fact that strikes occurred in four mines where machines are employed. These four mines employed 23 machines and a total of 453 men. The average time lost for each of the 23 machines was 142 days, 65 per cent of the total average working time for the State. This curtailed the machine-mined product by about 150,000 tons. In addition to this the machines introduced in 1898 were installed late in the year and added little to the product.

Notwithstanding the idleness due to the strikes referred to, and which represented a total loss of 60,148 working days, and one other of 75 days' idleness for 60 men, the average working time made throughout the State was better than in any year since 1892.

The details of the production in 1897 and 1898 are exhibited in the following tables:

Coal product of Colorado in 1897, by counties.

County.	Number of mines.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Average price per ton.	Average number of days active.	Average number of employees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Boulder	18	441,417	16,573	19,800	.....	477,790	\$619,122	\$1.29	164	805
Delta	3	.....	5,262	500	.....	5,765	8,397	1.46	208	23
Fremont.....	5	289,061	2,186	13,342	.....	304,589	494,312	1.62	123	896
Garfield	6	173,512	1,276	8,096	.....	182,884	203,912	1.12	241	216
Gunnison.....	6	173,252	2,037	7,206	114,922	297,417	438,908	1.48	165	692
Huerfano.....	11	333,676	3,797	30,421	.....	367,894	482,778	1.18	150	724
La Plata.....	6	68,158	5,073	100	3,458	76,788	112,359	1.46	218	130
Las Animas ..	10	1,062,792	15,606	11,458	337,670	1,427,526	1,359,022	.95	215	1,971
Pitkin.....	3	82,208	904	1,874	86,130	171,111	202,258	1.18	208	238
Rio Blanco....	4	.....	1,867	15	.....	1,882	3,220	1.71	129	9
Routt.....	9	262	683	.....	.....	945	1,548	1.64	47	17
Weld.....	4	3,360	4,600	350	.....	8,310	12,255	1.47	266	21
Arapahoe.....	2	12,349	480	20	.....	12,849	15,062	1.17	188	24
El Paso.....										
Jefferson.....	5	.....	14,845	600	.....	15,445	27,940	1.81	201	39
Larimer.....										
Mesa.....	5	9,000	1,508	.....	.....	10,508	16,098	1.53	167	47
Montrose.....										
Montezuma....										
Total ..	97	2,849,042	76,699	93,782	542,180	3,361,703	3,947,186	1.17	180	5,852

Coal product of Colorado in 1898, by counties.

County.	Number of mines.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Average price per ton.	Average number of days active.	Average number of employees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Boulder.....	17	387,919	30,345	33,275	.....	451,539	\$607,377	\$1.35	145	1,067
Delta.....	4	140	4,742	170	.....	5,052	6,560	1.30	221	10
Fremont.....	7	404,884	5,290	16,379	.....	426,553	682,583	1.60	154	1,045
Garfield.....	6	205,990	7,910	8,571	.....	222,480	234,554	1.05	224	345
Gunnison.....	5	193,643	8,588	5,185	115,905	323,321	417,607	1.29	252	477
Huerfano.....	14	931,023	6,383	36,258	102,217	1,075,881	1,185,244	1.10	275	1,452
Jefferson.....	3	.....	12,006	360	.....	12,366	15,536	2.07	223	27
La Plata.....	9	90,490	10,160	.....	.....	100,650	147,152	1.46	245	165
Las Animas.....	9	820,579	21,601	14,778	354,232	1,211,340	1,100,022	.91	255	1,465
Pitkin.....	3	70,016	912	1,436	123,132	195,496	210,376	1.08	286	198
Rio Blanco.....	4	.....	1,321	20	.....	1,341	2,606	1.94	104	8
Routt.....	7	.....	1,339	.....	.....	1,339	2,012	1.50	91	11
Weld.....	7	6,333	17,352	400	.....	24,085	34,000	1.41	214	68
Arapahoe.....										
El Paso.....	3	12,650	576	988	.....	14,214	14,942	1.06	91	59
Larimer.....										
Mesa.....										
Montezuma.....	3	9,000	1,690	.....	.....	10,690	15,510	1.45	121	43
Montrose.....										
Total...	101	3,132,676	130,305	117,820	695,546	4,076,347	4,686,081	1.15	220	6,440

Distribution of the coal product of Colorado from 1889 to 1898.

Year.	Number of mines.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Average price per ton.	Average number of days active.	Average number of employees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
1889.....		2,100,335	91,248	88,537	308,061	2,597,181	\$3,993,768	\$1.54	.....	4,904
1890.....		2,636,939	65,432	48,431	343,181	3,094,003	4,344,196	1.40	.....	5,627
1891.....		2,934,332	70,000	50,000	458,300	3,512,632	4,800,000	1.37	.....	6,000
1892.....		2,938,980	126,748	55,721	389,381	3,510,830	5,685,112	1.62	229	5,747
1893.....		3,345,951	65,396	178,993	512,059	4,102,389	5,104,602	1.24	188	7,202
1894.....	79	2,181,048	56,666	112,414	481,259	2,831,409	3,516,340	1.24	155	6,507
1895.....	87	2,445,578	49,088	99,055	480,261	3,062,982	3,675,185	1.20	182	6,125
1896.....	88	2,424,027	65,755	93,128	529,490	3,112,400	3,606,642	1.16	172	6,704
1897.....	97	2,649,042	76,699	98,782	542,180	3,361,703	3,947,186	1.17	180	5,852
1898.....	101	3,132,676	130,305	117,820	695,546	4,076,347	4,686,081	1.15	220	6,440

The following table presents the statistics of production by counties in Colorado since 1895, with the increases and decreases in 1898, as compared with 1897:

Coal product of Colorado since 1895, by counties.

County.	1895.	1896.	1897.	1898.	Increase in 1898.	Decrease in 1898.
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
Boulder	377,395	448,706	477,790	451,539	.....	26,251
Fremont	315,344	294,822	304,589	426,553	121,964	.....
Garfield	274,271	165,797	182,884	222,480	39,596	.....
Gunnison	239,182	260,596	297,417	323,321	25,904	.....
Huerfano	386,696	353,338	367,894	1,075,881	707,987	.....
Jefferson .....	.....	.....	10,445	12,366	1,921	.....
Las Animas	1,253,149	1,261,555	1,427,526	1,211,340	.....	216,186
La Plata	106,099	104,661	76,788	100,650	23,862	.....
Pitkin .....	.....	168,413	171,111	195,496	24,385	.....
Weld	27,934	4,300	8,310	24,085	15,775	.....
Other counties ..	102,912	50,212	36,949	32,636	.....	4,313
Total	3,082,982	3,112,400	3,361,703	4,076,347	714,644	.....

The first coal product reported from Colorado was in 1864, the entire product for the first eight years being from Jefferson and Boulder counties. Since 1864 the annual production has been as follows:

Coal product of Colorado since 1864.

Year.	Short tons.	Year.	Short tons.
1864	500	1882	1,061,479
1865	1,200	1883	1,229,593
1866	6,400	1884	1,130,024
1867	17,000	1885	1,356,062
1868	10,500	1886	1,368,338
1869	8,000	1887	1,791,735
1870	13,500	1888	2,185,477
1871	15,600	1889	2,597,181
1872	68,540	1890	3,077,003
1873	69,997	1891	3,512,632
1874	77,372	1892	3,510,830
1875	98,838	1893	4,102,289
1876	117,666	1894	2,831,409
1877	160,000	1895	3,082,982
1878	200,630	1896	3,112,400
1879	322,732	1897	3,361,703
1880	437,005	1898	4,076,347
1881	706,744		

GEORGIA.

Total product in 1898, 244,187 short tons; spot value, \$198,169.

The coal output of Georgia in 1898 exceeded that of 1897 by 48,318 short tons, or not quite 25 per cent. This was the first reaction from a steadily-decreasing output since 1893, when it reached a total of 372,740 short tons. The industry in 1898 was also marked by an improvement in values, the average price advancing from 72 cents in 1897 to 81 cents in 1898, and the total value increasing from \$140,466 to \$198,169, a gain of 41 per cent as compared with an increase of 25 per cent in tonnage.

The entire product of Georgia continues to come from two counties, Dade and Walker, in the northwestern corner of the State, which contain within their boundaries the extreme northeastern extremity of the Warrior coal field of Alabama.

The following table exhibits the tendency of coal production in the State, with the distribution of the product, value, etc., since 1889:

Coal product of Georgia since 1889.

Year.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Average price per ton.	Average number of days worked.	Average number of employees.
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
1889	46,131	158	15,000	164,645	225,934	\$338,901	\$1.50		
1890	57,949			170,388	228,337	238,315	1.04	313	425
1891	15,000	1,000	5,000	150,000	171,000	256,500	1.50	312	850
1892	52,614	250	3,756	158,878	215,498	212,761	.99	277	467
1893	196,227		4,869	171,644	372,740	365,972	.98	342	736
1894	178,610		8,978	166,523	354,111	299,290	.85	304	729
1895	135,692	150	6,256	118,900	260,998	215,863	.83	312	a 848
1896	120,496	875	7,520	109,655	238,546	168,050	.70	303	b 713
1897	120,398	1,481	5,500	68,490	195,869	140,466	.72	304	c 469
1898	135,926	890	5,650	101,721	244,187	198,169	.81	298	d 504

a Includes 500 State convicts.

c Includes 300 State convicts.

b Includes 360 State convicts.

d All convict labor.

The following table shows the total annual product since 1884:

Coal product of Georgia since 1884.

Year.	Short tons.	Year.	Short tons.
1884	150,000	1892	215,498
1885	150,000	1893	372,740
1886	223,000	1894	354,111
1887	313,715	1895	260,998
1888	180,000	1896	238,546
1889	225,934	1897	195,869
1890	228,337	1898	244,187
1891	171,000		

IDAHO.

Idaho's contribution to the coal product in 1898 amounted to 1,039 short tons, valued at \$2,675, against 150 short tons, worth \$350, in 1897. These are the only years in which coal production has been reported since 1888, when an output of 400 short tons was obtained.

ILLINOIS.

Total product in 1898, 18,599,299 short tons; spot value, \$14,567,598.

Following the usual custom, the statistics relating to the production of coal in Illinois during 1898 have been taken from the annual report of the State Bureau of Labor Statistics. In doing this the principal features only of the State report have been abstracted, and the statistics presented in a manner as nearly uniform with those of other States as possible.

Illinois was one of the three States whose product in 1898 was less than that of 1897. The other two exceptions to the general increase in production were Montana and Oregon. In Illinois the decrease in production was directly attributable to bitterly contested and protracted strikes in some of the larger mines of the State. The actual decrease as compared with the output of 1897 was 1,473,459 tons of 2,000 pounds, but as there was an increase of \$95,069 in the aggregate value of the product, the industry as a whole not only did not suffer from the loss in tonnage, but it is evident that the mines unaffected by the strike reaped a material benefit from the idleness forced upon their competitors.

Another observable feature in the statistics of Illinois production, common to most of the important coal-producing States, is the increase shown in the use of mining machines. The number of mines in which machines are used increased from 43 in 1897 to 55 in 1898, and the number of machines from 320 to 392. Owing, however, to the fact that the mines using machines were the ones principally affected by the strike, there was a decrease of over 500,000 tons in the machine-mined product, more than one-third of the total decrease in the State. The total production decreased about 7.3 per cent; the machine-mined product decreased about 14 per cent.

The following table exhibits the production of coal in Illinois since 1889, with the distribution of the product for consumption:

Distribution of the coal product of Illinois from 1889 to 1898.

Year.	Num- ber of mines.	Loaded at mines for ship- ment.	Sold to local trade and used by em- ployees.	Used at mines for steam and heat.	Made into coke at the mines.	Total product.	Total value.	Aver- age price per ton.	Aver- age num- ber of days active.	Average number of em- ployees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
1889..	^a 854	9,884,883	1,816,702	395,787	12,900	12,104,272	\$11,755,208	\$0.97	.....	.....
1890..	936	12,539,784	2,130,539	606,497	15,600	15,292,420	14,171,230	.93	204	28,574
1891..	918	12,787,903	2,246,705	610,000	16,000	15,660,698	14,237,074	.91	216	32,951
1892..	839	14,557,655	2,624,821	675,000	4,800	17,862,276	16,243,645	.91	220	34,585
1893..	788	16,280,463	2,931,846	753,955	3,300	19,949,564	17,827,595	.89	229	35,390
1894..	836	13,948,910	2,590,414	570,452	3,800	17,113,576	15,282,111	.89	183	38,477
1895..	^b 819	14,456,524	2,664,607	591,133	3,600	17,735,864	14,239,157	.80	182	38,630
1896..	330	16,128,103	2,995,022	659,601	3,900	19,786,626	15,809,736	.80	186	33,054
1897..	310	16,358,221	3,041,712	669,012	3,813	20,072,758	14,472,529	.72	185	33,788
1898..	329	15,596,888	2,149,808	852,603	.....	18,599,299	14,567,598	.78	175	35,026

^a From 1889 to 1894, including shipping and local mines.

^b Since 1894, shipping or commercial mines only.

The following table shows the product of lump coal and other grades of coal in Illinois, compared with the total output since 1882:

Total number of mines, men, and product, lump and other grades, since 1882.

Year.	Whole number of mines.	Whole number of men em- ployed.	Total prod- uct in tons (2,000 pounds).	Total tons of lump coal.	Total tons of other grades.
1882.....	704	20,290	11,017,069	9,115,653	1,901,506
1883.....	639	23,939	12,123,456	10,030,991	2,092,465
1884.....	741	25,575	12,208,075	10,101,005	2,107,070
1885.....	778	25,946	11,834,459	9,791,874	2,402,585
1886.....	787	25,846	11,175,241	9,246,435	1,928,806
1887.....	801	26,804	12,423,066	10,278,890	2,144,176
1888.....	822	29,410	14,328,181	11,855,188	2,472,993
1889.....	854	30,076	14,017,298	11,597,963	2,419,335
1890.....	936	28,574	15,292,420	12,638,364	2,654,056
1891.....	918	32,951	15,660,698	12,960,224	2,700,474
1892.....	839	34,585	17,862,276	14,730,963	3,131,313
1893.....	788	35,390	19,949,564	16,112,899	3,836,655
1894.....	836	38,477	17,113,576	13,865,284	3,248,292
1895.....	874	38,630	17,735,864	14,045,962	3,689,902
1896.....	901	33,054	19,786,626	14,210,024	5,576,602
1897.....	853	33,788	20,072,758	14,672,241	5,400,517
1898.....	881	35,026	18,599,299	14,208,795	4,390,504

In compiling the statistics for 1898, Mr. David Ross, secretary of the State bureau, instituted some inquiries in regard to the productive

capacity of the mines of the State. The returns from these inquiries indicate that the coal mines of Illinois, as at present developed, are capable of producing 41,000,000 tons per annum, 2.2 times the output of 1898.

In the following table will be found the statistics of production by counties during the last three years, with the increases and decreases in 1898:

Coal product of Illinois in 1896, 1897, and 1898, by counties.

County.	1896.	1897.	1898.	Increase in 1898.	Decrease in 1898.
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
Bond	71,058	104,256	96,314	.....	7,942
Brown .....	.....	1,760	1,940	180	.....
Bureau	1,042,304	1,145,312	865,892	.....	279,420
Calhoun	6,000	3,868	4,893	1,025	.....
Cass	8,612	4,536	2,900	.....	1,636
Christian	763,228	837,897	495,616	.....	342,281
Clinton	309,504	323,184	417,584	89,400	.....
Fulton	516,349	469,034	563,397	94,363	.....
Gallatin	26,350	19,945	16,812	.....	3,133
Greene	8,270	7,200	8,520	1,320	.....
Grundy	1,247,394	1,077,576	796,249	.....	281,327
Hamilton	1,000	760	4,882	4,122	.....
Hancock	4,497	4,160	5,600	1,440	.....
Henry	136,415	119,497	159,049	39,552	.....
Jackson	771,384	675,212	911,194	235,982	.....
Jefferson	10,100	51,355	46,060	.....	5,295
Jersey	a 2,325	.....	1,680	1,680	.....
Johnson	1,250	2,778	2,030	.....	748
Kankakee	72,395	180,683	84,632	.....	96,051
Knox	39,557	41,773	49,819	8,046	.....
Lasalle	1,409,085	1,508,833	1,165,490	.....	343,343
Livingston	218,953	145,206	122,087	.....	23,119
Logan	166,000	168,917	177,935	9,018	.....
Macon	188,207	173,163	300,264	127,101	.....
Macoupin	2,097,539	1,975,981	1,264,926	.....	711,055
Madison	1,080,718	780,921	630,769	.....	150,152
Marion	643,561	626,850	714,513	87,663	.....
Marshall	389,429	339,820	286,365	.....	53,455
McDonough	47,821	40,532	77,696	37,164	.....
McLean	156,891	153,334	171,594	18,260	.....
Menard	347,365	328,920	314,160	.....	14,760
Mercer	450,071	425,518	384,345	.....	41,173
Montgomery	171,099	251,249	294,667	43,418	.....
Morgan	(a)	.....	1,800	1,800	.....
Peoria	457,061	504,309	640,193	135,884	.....

Coal product of Illinois in 1896, 1897, and 1898, by counties—Continued.

County.	1896.	1897.	1898.	Increase in 1898.	Decrease in 1898.
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
Perry	626, 507	689, 921	845, 329	155, 408	.....
Randolph	202, 838	150, 647	274, 072	123, 425	.....
Rock Island..	34, 065	35, 651	47, 490	11, 839	.....
Saline.....	46, 495	51, 689	100, 005	48, 316	.....
Sangamon....	1, 587, 812	1, 838, 453	1, 763, 863	.....	74, 590
Schuyler	7, 915	7, 841	11, 149	3, 308	.....
Scott.....	18, 410	25, 125	21, 337	.....	3, 788
Shelby	35, 297	69, 329	68, 388	.....	941
Stark	18, 085	19, 472	21, 936	2, 464	.....
St. Clair	1, 671, 323	1, 718, 194	1, 600, 752	.....	117, 442
Tazewell	113, 541	86, 669	84, 507	.....	2, 162
Vermilion	1, 822, 344	2, 000, 623	1, 520, 699	.....	479, 924
Warren	12, 696	10, 099	12, 245	2, 146	.....
Washington..	33, 360	25, 715	43, 808	18, 093	.....
Will	86, 950	25, 682	40, 904	15, 222	.....
Williamson ..	444, 406	669, 480	915, 108	245, 628	.....
Woodford	162, 790	148, 829	145, 840	.....	2, 989
Total ..	19, 786, 626	20, 072, 758	18, 599, 299	.....	1, 473, 459

a Jersey County includes product of Morgan County.

b Net decrease.

INDIANA.

Total product in 1898, 4,920,743 short tons; spot value, \$3,994,918.

When, in 1897, the coal product of Indiana reached a total of 4,151,169 tons, it exceeded all previous records and passed for the first time the four-million-ton mark. Following this record, the output in 1898 shows an increase of nearly 770,000 tons, more than 18 per cent, and approximates another million mark and Indiana becomes sixth in the list of coal-producing States, passing both Iowa and Maryland. There is no doubt that the curtailment of the product of Illinois, due to the strikes in that State, had much to do with increasing the activity of the Indiana mines, and it remains to be seen whether the Indiana operators will be able to hold the markets thus obtained after the Illinois mines have returned to their normal condition. The Indiana mines were practically free from labor troubles in 1898, only two unimportant strikes, each of less than thirty days' duration, being reported.

Compared with 1897, and with 1896, there was a decline of 3 cents in the average price per ton, which was in part compensated for in the increased tonnage, while a continued increase in the use of machines for mining points to a decrease in the cost of production. The number of machines increased from 174 in 1897 to 233 in 1898, while the machine-mined product increased from 1,023,361 tons to 1,414,342 tons, so that of the total increase for the State about 45 per cent was in the increase in machine-mined coal.

Owen County was added to the list of counties producing coal upon a commercial scale, making a total of sixteen. The production by counties in 1897 and 1898 is shown in the following tables:

Coal product of Indiana in 1897, by counties.

County.	Number of mines.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Average price per ton.	Average number of days active.	Average number of employees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Clay	28	880,625	23,362	35,740	.....	925,727	\$992,515	\$1.07	169	2,682
Daviess.....	5	173,529	35,390	2,878	.....	211,797	192,532	.91	157	502
Fountain.....	4	159,606	15,953	3,100	.....	178,659	158,507	.89	213	235
Gibson										
Greene	6	435,939	968	11,976	.....	448,873	333,926	.74	186	890
Knox	3	21,362	14,390	1,000	.....	36,752	29,997	.82	190	96
Parke	13	400,013	19,985	14,009	.....	434,007	379,886	.88	164	1,126
Perry.....	2	17,612	5,580	520	.....	23,712	23,782	1.00	163	80
Pike.....	5	235,393	764	4,862	7,023	248,043	183,967	.74	188	427
Spencer.....	6	.....	4,339	.....	.....	4,339	4,973	1.15	141	20
Sullivan	13	449,008	16,277	14,760	.....	480,045	307,123	.64	147	913
Vanderburg	5	66,763	109,677	6,360	.....	182,800	153,230	.84	222	861
Vermillion	3	251,000	62,720	7,840	.....	321,560	253,000	.79	213	550
Vigo.....	10	425,185	11,011	6,335	.....	442,531	278,239	.63	173	767
Warrick.....	12	143,723	30,606	1,993	.....	176,324	144,671	.82	210	237
Small mines.....	.....	.....	36,000	.....	.....	36,000	36,000	.....	.....	.....
Total ..	115	3,639,758	393,012	111,876	7,023	4,151,169	3,472,348	.84	176	8,886

Coal product of Indiana in 1898, by counties.

County.	Number of mines.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Average price per ton.	Average number of days active.	Average number of employees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Clay	26	890,609	13,523	24,475	.....	928,607	\$984,898	\$1.06	182	2,416
Daviess.....	9	148,528	49,559	4,576	.....	202,693	189,668	.94	217	447
Fountain.....	3	135,800	2,900	500	.....	139,200	133,720	.96	274	130
Gibson	2	33,000	23,501	6,505	.....	63,006	50,825	.81	217	85
Greene	8	519,236	3,664	3,900	.....	526,800	427,875	.81	167	994
Knox	3	32,833	18,427	5,272	.....	56,532	46,824	.83	177	138
Owen and Parke.....	18	534,431	6,469	18,045	.....	558,945	473,548	.85	198	1,117
Perry.....	2	19,537	7,225	400	.....	27,162	27,277	1.00	181	90
Pike.....	7	238,803	1,390	4,220	4,065	248,478	139,309	.56	193	390
Spencer.....	9	.....	6,623	10	.....	6,633	7,967	1.20	140	33
Sullivan	15	566,531	37,828	13,490	.....	637,849	411,472	.65	181	826
Vanderburg.....	6	46,538	138,674	11,860	.....	197,072	177,603	.90	243	352
Vermillion	3	250,238	.....	11,500	.....	261,738	166,493	.64	194	375
Vigo.....	17	843,510	18,242	22,357	.....	884,109	617,739	.70	244	1,371
Warrick.....	13	118,484	23,735	8,700	.....	145,919	163,700	.71	211	207
Small mines.....	.....	.....	36,000	.....	.....	36,000	36,000	.....	.....	.....
Total ..	141	4,398,078	387,790	130,810	4,065	4,920,743	3,994,918	.81	199	8,971

Distribution of the coal product of Indiana from 1889 to 1898.

Year.	Num- ber of mines.	Loaded at mines for ship- ment.	Sold to local trade and used by em- ployees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Aver- age price per ton.	Aver- age num- ber of days active.	Average number of em- ployees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
1889.....		2,527,112	237,935	67,210	12,800	2,845,057	\$2,887,852	\$1.02	.....	6,448
1890.....		3,036,737	225,187	84,703	9,130	3,305,737	3,259,233	.91	220	5,489
1891.....		2,689,780	211,854	63,152	8,688	2,973,474	3,070,918	1.03	190	5,870
1892.....		3,088,911	208,220	42,621	5,422	3,345,174	3,620,582	1.08	225	6,436
1893.....		3,461,830	252,879	60,797	7,345	3,791,851	4,055,872	1.07	201	7,644
1894.....	107	3,085,664	248,398	67,545	22,314	3,423,921	3,295,084	.96	149	8,603
1895.....	117	3,488,876	392,423	104,695	9,898	3,905,892	3,642,623	.91	189	8,530
1896.....	131	3,471,470	311,911	113,442	8,956	3,905,779	3,261,737	.84	163	8,806
1897.....	115	3,639,758	393,012	111,376	7,028	4,151,169	3,472,348	.84	176	8,886
1898.....	141	4,398,078	387,790	130,810	4,065	4,920,743	3,994,918	.81	199	8,971

The product by counties during the last four years is presented in the following table, with the increases and decreases in 1898 as compared with 1897:

Coal product of Indiana since 1895 by counties.

County.	1895.	1896.	1897.	1898.	Increase in 1898.	Decrease in 1898.
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
Clay	1,223,186	1,232,435	925,727	928,607	2,880	.....
Daviess	81,380	192,775	211,797	202,693	.....	9,104
Fountain.....	.....	106,650	137,250	139,200	1,950	.....
Gibson	1,940	24,775	41,409	63,006	21,597	.....
Greene	409,080	290,046	448,873	526,800	77,927	.....
Knox	26,443	30,500	36,752	56,532	19,780	.....
Owen .....	.....	.....	.....	7,808	7,808	.....
Parke	479,609	339,677	434,007	551,137	117,130	.....
Perry	18,960	26,227	23,712	27,162	3,450	.....
Pike	232,950	201,417	248,043	248,478	435	.....
Spencer	10,879	16,703	4,339	6,633	2,294	.....
Sullivan	453,167	515,285	480,045	637,849	157,804	.....
Vanderburg ..	192,710	170,755	182,800	197,072	14,272	.....
Vermillion...	306,000	347,166	321,560	261,738	.....	59,822
Vigo	402,335	237,647	442,531	884,109	441,578	.....
Warrick	121,253	138,721	178,324	145,919	.....	30,405
Small mines.	36,000	36,000	36,000	36,000	.....	.....
Total..	3,995,892	3,905,779	4,151,169	4,920,743	769,574	.....

a Net increase.

In the following table is shown the total annual product of coal in the State since 1873:

Product of coal in Indiana from 1873 to 1898.

Year.	Quantity.	Year.	Quantity.
	<i>Short tons.</i>		<i>Short tons.</i>
1873.....	1,000,000	1886.....	3,000,000
1874.....	812,000	1887.....	3,217,711
1875.....	800,000	1888.....	3,140,979
1876.....	950,000	1889.....	2,845,057
1877.....	1,000,000	1890.....	3,305,737
1878.....	1,000,000	1891.....	2,973,474
1879.....	1,196,490	1892.....	3,345,174
1880.....	1,500,000	1893.....	3,791,851
1881.....	1,771,536	1894.....	3,423,921
1882.....	1,976,470	1895.....	3,995,892
1883.....	2,560,000	1896.....	3,905,779
1884.....	2,260,000	1897.....	4,151,169
1885.....	2,375,000	1898.....	4,920,743

INDIAN TERRITORY.

Total product in 1898, 1,381,466 short tons; spot value, \$1,827,638.

While the coal product of the Indian Territory in 1898 was 45,086 short tons larger than that of 1897, and the largest in the history of coal mining in the Territory, it was less than 15,000 short tons in excess of the product in 1896, and the increase compared with that of other States with which Territory coal is obliged to compete amounted practically to a decrease. The States whose product competes in common markets with Territory coal are Alabama, Arkansas, and Kansas. Arkansas is the principal competitor, and, as shown elsewhere, the tonnage of that State in 1898 was 40 per cent larger than that of 1897. The amount of increase was 349,289 short tons. The product of Alabama did not show as large a percentage of increase (11 per cent), but the amount of increase was nearly double that of Arkansas, being 642,000 short tons. The product of Kansas increased about 350,000 short tons, or about 11 per cent. It is only reasonable to suggest that this increased tonnage should have been shared by the mines of the Indian Territory. The operators mining coal under lease from the Chickasaw and Choctaw Nations have until recently been put at a disadvantage by the high royalty they were compelled to pay. Formerly this was fixed at about 17½ cents per short ton of screened coal. This rate was nearly three times the average rate paid in competitive fields. Notwithstanding this, however, by an agreement entered into between the "Dawes Commission," acting for the United States, and the commissions of the Choctaw and Chickasaw Nations, and ratified

by Congress, June 28, 1898, the royalty rate was fixed at 15 cents per short ton for mine-run coal. This was equivalent to about 22 cents per ton on screened coal. It was claimed by the operators, with evident justice, that this was practically prohibitive. A provision in the act of June 28, however, permitted the Secretary of the Interior to reduce or advance the royalty on coal (and asphalt, which by the same agreement was placed at 60 cents per ton) when in his judgment it was to the best interests of the Indians to do so. In September, 1898, the principal operators in the Territory presented a petition to the Secretary of the Interior protesting against this excessive royalty. A hearing was set for December 12 (postponed by request of the operators from November 23), at which representatives of the mining companies and counsel for the Indians were present. On January 6, the Secretary of the Interior, Hon. C. R. Bliss, rendered his decision, which, omitting the introductory remarks, was as follows:

It appears, from the evidence submitted, that certain of the petitioners and others have for many years prior to the passage of the act aforesaid—some of them ever since the extensive mining of coal was begun in the Indian Territory about twenty-six years ago—been mining coal, under leases, from the lands of the said nations. The royalty usually paid heretofore by the lessees has been three-fourths of a cent per bushel of 85 pounds of screened coal, or about 17½ cents per ton of 2,000 pounds, two-thirds of which royalty was paid to the said nations and one-third to individual leaseholders, citizens of these nations. Under the provisions of the said section no royalty is any longer payable to such individual leaseholders, but all royalties are to be paid into the United States Treasury, to be there held in trust for the said tribes or nations, so much thereof as may be necessary for the purpose to be devoted to "the education of the children of Indian blood of the members of said tribes."

The royalty as fixed by the said regulations is to be paid on all coal mined; that is, on what is called mine-run coal as distinguished from screened coal, which, in the Indian Territory, is coal run over a screen the meshes of which are 1 inch square. In the screening process, from one-fourth to one-third of the coal as it comes from the mine passes through the screen. In the Indian Territory, only that which passes over the screen has any commercial value, so that a royalty of 15 cents per ton on all coal mined, or mine-run coal, amounts to about 22 cents per ton on screened or marketable coal. This rate, or even the rate heretofore paid in the Choctaw and Chickasaw country, is found to be far in excess of any rate of royalty paid in any other part of the United States from which statistics were presented at the hearing. In the coal regions east of the Missouri and Mississippi rivers, embraced in the States of Iowa, Illinois, Indiana, Ohio, Kentucky, West Virginia, and Virginia, the rate of royalty from coal screened as Indian Territory coal is screened, or its equivalent, nowhere exceeds 10 cents per ton of 2,000 pounds, and is generally considerably within that figure. The royalties in those States the coal of which enters the same markets as Indian Territory coal—that is, the States of Missouri, Kansas, Colorado, Arkansas, Alabama, and Texas—do not in any instance, so far as disclosed at the hearing, exceed 8½ cents per ton on screened coal, and the average is only slightly in excess of 7 cents per ton. By legislative enactment the State of Kansas has fixed the royalty on coal mined beneath the streets, alleys, and public grounds of any city of the first or second class at one-fourth of a cent per bushel, or about 6½ cents per ton. (General Stats. Kansas, 1897, sec. 54, p. 825.) In most of these States royalties should naturally be greater than in the Indian Territory, for the reason that the veins of coal are thicker, and royalties increase with the thickness of the veins. Recent leases for mining coal from the lands of the Creek Nation provide for a royalty of only 5 cents per ton.

It is shown that miners' wages in the Indian Territory are higher than in the States whose coal competes with the coal of that Territory, while the cost of coal transportation is as low in and from the Territory as in and from those States; also that although the cost of production in the Territory has decreased about 20 per cent in the past fifteen years, it has not kept pace with the decrease in adjoining States and with the decline in the market price of coal, which results, petitioners claim, are due to the excessive royalty required of them. The manager of the mines of one of the operating companies, in an affidavit dated December 13, 1898, swears that the price received per ton for the coal produced by the company in 1896 was but 3 cents above the cost of production, and in 1897 but 2 cents, and that in 1898 the mines leased by the company were operated at a loss of 6 cents per ton on the product; and further, that no allowance is made in arriving at these results for depreciation of plant or interest on the capital invested. This company has for years been the largest producer of coal in the Territory, its output for the year ended June 30, 1898, being nearly one-third of the total product of the Territory.

Statistics collected by the United States Geological Survey show that the coal product of the States of Alabama and Arkansas, the chief competitors of the Indian Territory in the coal market during the ten years ended in 1897, increased 203 per cent and 561 per cent, respectively, while that of the Territory, with twice the coal area, increased less than 95 per cent. This disparity of increase against the output of the Territory is claimed to be due solely to the depressing effect of the excessive royalty there required to be paid. From this burden, while the imposition of the royalty was controlled by the Indian tribes, there was no effective means of relief, and the companies operating in the face of the increasing competition have been compelled to rely more and more each year upon local consumption, especially by railroads entering or passing through the Territory.

The State of Texas has heretofore, until recently, supplied a large market for Indian Territory coals, but it appears that the rapid development of the coal fields in the eastern part of that State during the past ten years, with consequent large decline in the local price of coal, and the low price at which Arkansas and Alabama coal can be sold there, have to a large extent deprived Indian Territory operators of that market. Again, coal lands in the adjoining States are generally either owned by the coal operators or may be purchased at prices ranging from \$20 to \$50 per acre, while in the said Territory the royalty heretofore paid amounts, on an average, to nearly \$500 per acre, and under the regulation in question would amount to about \$600 per acre.

It is urged by petitioners, in view of the foregoing, that unless the royalty is materially reduced it is only a question of a short time when they and all others governed by the said regulations will be compelled to practically suspend mining coal for commercial purposes. Such a result would deprive the Government, as trustee, of needed revenue for the education of Indian children, * * * the members of the said tribes of the individual benefits to accrue from the distribution of the fund arising from such royalty, whenever their schools are supported by taxation, as provided in said agreement, and the Indian communities of the benefits resulting from the successful operation of a large mining industry in their midst, affording at their homes a valuable market for so much of their products as may be required to sustain the mining population employed. Petitioners further insist that a royalty of 8 cents per ton of 2,000 pounds is the maximum royalty that lessees of coal lands in the Choctaw and Chickasaw Nations can afford to pay and at the same time realize a fair profit upon the capital employed in mining operations.

The Secretary is authorized by the said agreement, now a law of Congress, as hereinbefore pointed out, to advance or reduce royalties on coal only "when he deems it for the best interests of the Choctaws and Chickasaws to do so." It was evidently intended that the royalties should be fixed upon a revenue-producing basis and not that they should be prohibitive. If, as appears from the showing made, the royalty fixed by existing regulations is practically prohibitive, the best

interests of these Indians require that it be reduced at once to a revenue basis. Such a basis will not be reached until the lessees of Indian coal lands can place their product on the market in successful competition with the similar products of the adjoining States. The Secretary is well convinced that the royalty now required is too high to permit this to be done. Upon very careful and painstaking consideration of the subject he has reached the conclusion that the best interests of the said nations will be subserved, under existing conditions, by a royalty of 10 cents per ton of 2,000 pounds of coal screened over meshes 1 inch square. This royalty, it is estimated, will yield a revenue upon each acre of coal mined of about \$300.

The regulation in question is therefore hereby modified in accordance with the views herein expressed, and the regulation issued by the Department on November 4, 1898, under the provision of section 13 of said act of June 28, 1898, is also modified so as to make the royalty uniform in said Territory under said act and the regulations issued thereunder. The modifications herein made shall become effective from January 1, 1899.

The use of machines in the Territory mines showed a slight increase in 1898. One mine introduced them for the first time during the year. The number of machines in use was increased from 54 to 75, and the machine-mined tonnage from 263,811 to 274,370, a gain of 10,559 as against an increase of 72,226 tons from 1896 to 1897.

The Territory mines were comparatively free from labor troubles in 1898, only one strike which affected about 30 men being reported.

The average selling price for Territory coal has shown a steadily declining tendency since 1893, when it was \$1.79 per ton. In 1896 it had fallen to \$1.40 per ton; a further decline of 6 cents in 1897 brought it down to \$1.34, and a still further decline to \$1.32 is shown in the figures for 1898, making a total decline in five years of 47 cents, or over 26 per cent.

The following table exhibits the details of production during the past eight years:

Coal product of the Indian Territory since 1891.

Distribution.	1891.	1892.	1893.	1894.
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
Loaded at mines for shipment.....	1, 026, 932	1, 156, 603	1, 197, 468	923, 581
Sold to local trade and used by employees.....	9, 405	10, 840	9, 234	4, 632
Used at mines for steam and heat	22, 163	18, 089	21, 663	30, 878
Made into coke.....	32, 532	7, 189	23, 745	10, 515
Total	1, 091, 032	1, 192, 721	1, 252, 110	969, 606
Total value	\$1, 897, 037	\$2, 043, 479	\$2, 235, 209	\$1, 541, 293
Average number of employees.....	2, 891	3, 257	3, 446	3, 101
Average number of days worked	222	211	171	157

Coal product of the Indian Territory since 1891—Continued.

Distribution.	1895.	1896.	1897.	1898.
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
Loaded at mines for shipment.....	1, 173, 399	1, 295, 742	1, 250, 066	1, 310, 178
Sold to local trade and used by employees.....	3, 070	12, 648	9, 068	16, 632
Used at mines for steam and heat.....	21, 935	45, 560	47, 501	34, 055
Made into coke.....	12, 781	12, 696	29, 745	20, 601
Total	1, 211, 185	1, 366, 646	1, 336, 380	1, 381, 466
Total value	\$1, 737, 254	\$1, 918, 115	\$1, 787, 358	\$1, 827, 638
Average number of employees	3, 212	3, 549	3, 168	3, 216
Average number of days worked	164	170	176	198

Since 1885 the annual production has been as follows:

Product of coal in the Indian Territory from 1885 to 1898, inclusive.

Year.	Quantity.	Value.	Average price per ton.	Average number of days active.	Average number of employees.
	<i>Short tons.</i>				
1885.....	500, 000				
1886.....	534, 580	\$855, 328	\$1. 60		
1887.....	685, 911	1, 286, 692	1. 88		
1888.....	761, 986	1, 432, 072	1. 89		
1889.....	752, 832	1, 323, 807	1. 76		1, 862
1890.....	869, 229	1, 579, 188	1. 82	238	2, 571
1891.....	1, 091, 032	1, 897, 037	1. 71	222	2, 891
1892.....	1, 192, 721	2, 043, 479	1. 71	211	3, 257
1893.....	1, 252, 110	2, 235, 209	1. 79	171	3, 446
1894.....	969, 606	1, 541, 293	1. 59	157	3, 101
1895.....	1, 211, 185	1, 737, 254	1. 43	164	3, 212
1896.....	1, 366, 646	1, 918, 115	1. 40	170	3, 549
1897.....	1, 336, 380	1, 787, 358	1. 34	176	3, 168
1898.....	1, 381, 466	1, 827, 638	1. 32	198	3, 216

IOWA.

Total product in 1898, 4,618,842 short tons; spot value, \$5,260,716.

Coal production in Iowa during 1898 was practically the same as in 1897, the difference being less than 7,000 short tons, which, however, was on the favorable side of the balance sheet. The improved industrial conditions in Iowa were manifested, so far as coal mining was concerned, by an increased value of the product rather than by increased tonnage. The advance in the average price per ton from \$1.13 to \$1.14 was slight, it is true, but is significant when considered with the general tendency to lower prices, and particularly when cost of mining is steadily lessening.

Strikes occurred during the year in 14 mines, 7 of which were in Appanoose County and 1 each in Greene, Jasper, Keokuk, Mahaska, Wapello, Wayne, and Webster. The total number of men on strike was 544; the total time lost was 10,976 working days, an average of 20 days per man. The number of men made idle in Appanoose County was 222, for an average of 27½ days, entailing a total loss in working time of 6,100 days, so that two-fifths of the men made idle and practically three-fifths of the total time lost were in the mines of Appanoose County.

The amount of coal mined by machines in Iowa during 1898 was 236,380 short tons, an increase of about 55,000 tons, or a little more than 30 per cent over 1897, when the machine-mined product was 181,209 short tons. In 1896 the amount of coal undercut by machines was 84,556 short tons, so that the tonnage won by machines in 1898 was nearly three times what it was in 1896. The number of machines in use in 1898 was 64, 3 less than in 1897.

Considering the production in 1898 by its county distribution it is shown that in the more important producers there were eight counties in which the product was larger than in 1897 and eight counties in which the output decreased. The largest increase was in Polk County, whose product in 1898 was 146,470 short tons, or 30 per cent in excess of that of 1897. This was partly offset by a decrease of 127,723 short tons in Mahaska County. Monroe County had the next largest increase in production, with a gain of 86,747 short tons, while Appanoose, with the next largest decrease, showed a loss of 61,978 short tons.

The production, by counties, in 1897 and 1898, with the distribution of the output for consumption, is shown in the following tables:

Coal product of Iowa in 1897, by counties.

County.	Number of mines.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Total product.	Total value.	Average price per ton.	Average number of days active.	Average number of employees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Appanoose .	43	630,536	26,464	13,143	670,143	\$793,254	\$1.18	186	2,254
Boone	15	261,967	27,455	2,896	292,218	445,455	1.52	150	1,043
Greene	5	200	8,525	520	9,245	14,398	1.56	143	64
Jasper	4	172,560	2,732	4	175,316	201,530	1.15	205	256
Keokuk	8	280,732	6,011	2,735	289,478	304,316	1.05	196	572
Mahaska	16	a 1,850,634	56,162	13,714	1,420,510	1,431,245	1.01	235	2,536
Marion	14	118,344	9,212	1,946	129,502	135,212	1.04	175	342
Monroe	6	479,226	5,723	12,882	497,831	498,557	1.00	229	986
Polk	20	314,558	161,528	13,050	489,136	604,041	1.23	204	1,221
Story	2	9,412	3,760	.....	13,172	20,649	1.57	163	56
Taylor	2	8,406	2,305	15	10,726	19,134	1.78	196	42
Wapello	7	188,168	34,413	6,889	229,470	232,471	1.01	167	552
Warren	4	.....	6,588	23	6,610	10,220	1.55	129	33
Wayne	2	48,348	8,054	594	56,996	74,570	1.31	194	191
Webster	12	152,915	14,370	1,614	168,899	238,819	1.41	211	520
Dallas	2	8,018	3,125	1,470	12,613	20,632	1.64	255	35
Van Buren .									
Small mines .....	.....	.....	140,000	.....	140,000	175,000	.....	.....	.....
Total ..	162	a 4,023,944	516,427	71,494	4,611,865	5,219,503	1.18	201	10,703

a Including 22,633 tons made into coke.

Coal product of Iowa in 1898, by counties.

County.	Number of mines.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Total product.	Total value.	Average price per ton.	Average number of days active.	Average number of employees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Appanoose .	49	569,020	34,857	4,238	608,165	\$726,932	\$1.20	172	1,955
Boone	17	298,613	32,076	854	331,543	473,342	1.43	245	1,096
Dallas	2	2,964	4,013	930	7,907	12,653	1.60	227	83
Greene	5	665	11,480	775	12,920	21,318	1.65	194	60
Jasper	6	140,000	3,925	10	143,935	205,686	1.43	210	268
Keokuk	9	230,909	25,636	4,600	251,145	265,886	1.06	240	521
Mahaska	21	1,238,810	37,895	16,082	1,292,787	1,304,727	1.01	236	2,400
Marion	15	114,954	11,822	517	127,293	113,329	.89	217	245
Monroe	7	558,479	11,947	14,152	584,578	594,980	1.02	232	1,086
Page and Story	3	4,990	6,295	400	11,685	20,124	1.72	172	47
Polk	16	428,824	194,217	12,565	635,606	787,940	1.24	234	1,353
Taylor	2	5,660	880	15	6,555	12,485	1.90	182	26
Van Buren ..	2	4,220	2,280	100	6,600	9,600	1.45	257	14
Wapello	8	229,544	13,190	6,890	249,624	254,661	1.02	212	473
Warren	4	300	6,814	6	7,120	10,570	1.48	88	46
Wayne	3	38,643	12,352	555	51,550	68,633	1.33	201	205
Webster	13	119,967	14,923	2,653	137,543	180,885	1.32	222	379
Adams	5	4,800	7,456	25	12,281	21,965	1.79	197	57
Lucas									
Small mines .....	.....	.....	140,000	.....	140,000	175,000	.....	.....	.....
Total ..	187	3,961,362	572,063	65,417	4,618,842	5,260,716	1.14	219	10,262

Distribution of the coal product of Iowa from 1889 to 1898.

Year.	Num- ber of mines.	Loaded at mines for ship- ment.	Sold to local trade and used by em- ployees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Aver- age price per ton.	Aver- age num- ber of days active.	Average number of em- ployees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
1889..		3,530,378	464,735	100,213	37	4,095,358	\$5,426,509	\$1.33	.....	9,247
1890..		3,500,738	397,503	63,498		4,021,739	4,995,739	1.24	213	8,130
1891..		3,263,347	373,025	88,966	157	3,825,495	4,867,999	1.27	224	8,124
1892..		3,450,025	401,855	57,611		3,918,491	5,175,090	1.32	236	8,170
1893..		3,442,584	449,639	80,006		3,972,229	5,110,460	1.30	204	8,863
1894..	174	3,390,751	511,683	64,819		3,967,253	4,997,939	1.26	170	9,995
1895..	177	3,630,867	460,820	64,387		4,156,074	4,962,102	1.20	189	10,006
1896..	182	3,367,813	494,443	91,766		3,954,028	4,628,022	1.17	178	9,672
1897..	162	a 4,023,944	516,427	71,494		4,611,865	5,219,503	1.13	201	10,703
1898..	187	3,981,362	572,063	65,417		4,618,842	5,260,716	1.14	219	10,262

a Includes 22,633 tons made into coke.

Coal product of Iowa since 1895, by counties.

County.	1895.	1896.	1897.	1898.	Increase in 1898.	Decrease in 1898.
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
Appanoose.....	588,438	544,678	670,143	608,165	.....	61,978
Boone.....	268,422	316,756	292,218	331,543	39,325	.....
Dallas.....	6,061	9,624	6,853	7,907	1,054	.....
Greene.....	7,197		9,245	12,920	3,675	.....
Jasper.....	155,707	164,110	175,316	143,935	.....	31,381
Keokuk.....	266,394	214,474	289,478	251,145	.....	38,333
Mahaaka.....	1,016,623	1,047,241	1,420,510	1,292,787	.....	127,723
Marion.....	193,768	93,023	129,502	127,293	.....	2,209
Monroe.....	559,982	433,520	497,831	584,578	86,747	.....
Polk.....	485,360	546,051	489,136	635,606	146,470	.....
Taylor.....	14,062	8,400	10,726	6,555	.....	4,171
Van Buren.....	9,896	8,396	5,760	6,600	840	.....
Wapello.....	261,510	227,077	229,470	249,624	20,154	.....
Warren.....	6,116	12,824	6,610	7,120	510	.....
Wayne.....	46,315	42,732	56,996	51,550	.....	5,446
Webster.....	123,882	134,704	168,899	137,548	.....	31,351
Other counties and small mines.	146,341	150,418	153,172	163,966	10,794	.....
Total.....	4,156,074	3,954,028	4,611,865	4,618,842	a 6,977	.....

a Net increase.

Iowa holds first place among the coal-producing States west of the Mississippi River, having held this position continuously for eleven years except in 1893, when an unusually large production in Colorado gave that State a temporary lead.

Below is given in tabular form the output of Iowa in all the years for which figures are obtainable, with the value and average price per ton when known, and the statistics of labor employed, during the past ten years:

Product of coal in Iowa from 1860 to 1898, inclusive.

Year.	Quantity.	Value.	Average price per ton.	Average number of days active.	Average number of employees.
	<i>Short tons.</i>				
1860.....	48,263	\$92,180	\$1.91	.....	.....
1865.....	69,574	.....	.....	.....	.....
1866.....	99,320	.....	.....	.....	.....
1868.....	241,453	.....	.....	.....	.....
1870.....	283,467	.....	.....	.....	.....
1875.....	1,231,547	2,500,140	2.03	.....	.....
1880.....	1,461,166	2,507,453	1.72	.....	.....
1882.....	3,920,000	.....	.....	.....	.....
1883.....	4,457,540	.....	.....	.....	.....
1884.....	4,370,566	.....	.....	.....	.....
1885.....	4,012,575	.....	.....	.....	.....
1886.....	4,315,779	5,391,151	1.25	.....	.....
1887.....	4,473,828	5,991,735	1.34	.....	.....
1888.....	4,952,440	6,438,172	1.30	.....	.....
1889.....	4,095,358	5,426,509	1.33	.....	9,247
1890.....	4,021,739	4,995,739	1.24	213	8,130
1891.....	3,825,495	4,807,999	1.27	224	8,124
1892.....	3,918,491	5,175,060	1.32	236	8,170
1893.....	3,972,229	5,110,460	1.30	204	8,863
1894.....	3,967,253	4,997,939	1.26	170	9,995
1895.....	4,156,074	4,982,102	1.20	189	10,066
1896.....	3,954,028	4,628,022	1.17	178	9,672
1897.....	4,611,865	5,219,503	1.13	201	10,703
1898.....	4,618,842	5,260,716	1.14	219	10,256

KANSAS.

Total product in 1898, 3,406,555 short tons; spot value, \$3,703,014.

Kansas ranks third among the coal-producing States west of the Mississippi River, following Iowa (first) and Colorado. The product of Kansas in 1898 was 352,543 short tons or 11.5 per cent larger than that of 1897, and reached the maximum figure in the history of the State. The highest record previously made was in 1894, when, on account of the strikes in other States, the product of Kansas increased to 3,388,251 short tons, as compared with 2,652,546 short tons in 1893. It dropped back to 2,927,000 tons in 1895, and still further to 2,885,000 tons in 1896.

The increased production in 1898 was not accompanied, as in Iowa, with a corresponding increase in value, for while the product increased 11.5 per cent the increase in value was less than 3 per cent, and the

average price declined, from \$1.18 to \$1.09 per ton. The industry in Kansas was not materially affected by labor troubles in 1898, the few strikes which occurred being unimportant so far as the number of men involved is concerned, and short as to time. Only 2 machines were used for cutting coal during the year, producing 11,722 against 1 machine and 4,500 tons in 1897.

The details of production by counties during the last two years, together with the distribution of the product for consumption, are presented in the following tables:

Coal product of Kansas in 1897, by counties.

County.	Number of mines.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Average price per ton.	Average number of days active.	Average number of employees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Atchison	2	.....	7,250	.....	.....	7,250	\$18,175	\$2.50	300	18
Cherokee	17	973,456	14,895	16,570	.....	1,004,921	1,216,788	1.31	196	1,941
Crawford	20	1,323,231	10,293	19,399	.....	1,352,923	1,453,625	1.07	198	2,520
Franklin	2	3,450	1,600	.....	.....	5,140	8,995	1.75	196	42
Leavenworth	3	262,920	84,747	18,447	248	366,362	485,202	1.32	243	1,067
Linn	2	25,496	1,946	.....	.....	27,432	29,244	1.07	218	72
Osage	23	156,568	12,523	314	.....	169,395	269,035	1.59	122	975
Douglas	2	.....	589	.....	.....	589	1,262	2.14	130	4
Labette .....		.....	.....	.....	.....	.....	.....	.....	.....	.....
Small mines .....	.....	.....	120,000	.....	.....	120,000	120,000	1.00	.....	.....
Total ..	71	2,745,101	253,933	54,730	248	3,054,012	3,602,326	1.18	194	6,639

Coal product of Kansas in 1898, by counties.

County.	Number of mines.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Total product.	Total value.	Average price per ton.	Average number of days active.	Average number of employees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Cherokee	26	1,070,189	22,142	18,196	1,110,527	\$1,116,493	\$1.01	183	2,263
Crawford	27	1,621,070	16,777	16,646	1,654,493	1,715,431	1.04	225	2,887
Franklin	2	1,518	4,915	.....	6,433	11,459	1.78	158	40
Leavenworth	5	207,390	83,532	14,645	305,576	401,892	1.32	207	759
Linn	2	18,293	2,249	.....	20,542	21,769	1.06	261	74
Osage	37	161,132	20,579	445	182,156	297,587	1.63	128	1,103
Atchison, Cloud, Coffee, and Elk ..	5	.....	5,180	.....	5,180	14,005	2.70	121	42
Ellsworth, Labette, and Lincoln	4	.....	845	.....	845	1,998	2.36	50	22
Russell and Shawnee	2	.....	803	.....	803	2,380	2.96	111	7
Small mines .....	.....	.....	120,000	.....	120,000	120,000	.....	.....	.....
Total	110	3,079,801	277,022	49,932	3,406,555	3,703,014	1.09	194	7,197

Distribution of the coal product of Kansas from 1889 to 1898.

Year.	Num- ber of mines.	Loaded at mines for shipment.	Sold to lo- cal trade and used by em- ployees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Aver- age price per ton.	Aver- age num- ber of days active.	Average number of em- ployees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
1889	.....	1,891,090	300,207	29,246	500	2,221,043	\$3,296,888	\$1.48	.....	5,956
1890	.....	2,028,100	224,839	6,983	.....	2,259,922	2,947,517	1.30	210	4,523
1891	.....	2,428,787	255,839	31,046	133	2,716,705	3,557,305	1.31	222	6,201
1892	.....	2,756,812	206,038	44,325	101	3,007,276	3,955,595	1.31½	208½	6,559
1893	.....	2,364,810	227,321	60,412	3	2,652,546	3,375,740	1.27	147	7,310
1894	113	3,066,398	275,565	45,523	765	3,388,251	4,178,998	1.23	164	7,339
1895	106	2,587,602	279,739	59,142	387	2,926,870	3,481,981	1.20	159	7,482
1896	96	2,562,779	256,906	63,901	1,215	2,884,801	3,295,032	1.15	168	7,127
1897	71	2,745,101	253,933	54,730	248	3,054,012	3,602,326	1.18	194	6,639
1898	110	3,079,601	277,022	49,932	.....	3,406,555	3,703,014	1.09	194	7,177

Considered by counties, it is seen that of the four principal coal producers three increased their output in 1898, while only one showed a decrease. Crawford County, the leading one in coal production, had an increased product of 301,570 short tons, or 18 per cent. Cherokee County, second in importance, increased its output 105,606 short tons, or 10.5 per cent. Leavenworth County lost 60,786 short tons, and Osage County gained 12,761 short tons. The other changes were unimportant.

Coal product of Kansas in 1896, 1897, and 1898, by counties.

County.	1896.	1897.	1898.	Increase in 1898.	Decrease in 1898.
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
Atchison	4,592	7,250	3,000	.....	4,250
Cherokee	985,132	1,004,921	1,110,527	105,606	.....
Crawford	1,271,434	1,352,923	1,654,493	301,570	.....
Franklin	12,861	5,140	6,433	1,293	.....
Leavenworth	284,700	366,362	305,576	.....	60,786
Linn	14,534	27,432	20,542	.....	6,890
Osage	190,948	169,395	182,156	12,761	.....
Other counties and small mines	120,600	120,589	123,828	3,239	.....
Total	2,884,801	3,054,012	3,406,555	352,543	.....

^a Net increase.

The following table shows in condensed form the statistics of coal production in Kansas since 1880. It will be noted that the years 1893, 1895, and 1896 were the only exceptions to a continual annual increase in the product.

Coal product of Kansas since 1880.

Year.	Short tons.	Value.	Average price per ton.	Average number of days active.	Average number of men employed.
1880.....	550,000	.....	.....	.....	.....
1881.....	750,000	.....	.....	.....	.....
1882.....	750,000	.....	.....	.....	.....
1883.....	900,000	.....	.....	.....	.....
1884.....	1,100,000	.....	.....	.....	.....
1885.....	1,212,057	\$1,485,002	\$1.23	.....	.....
1886.....	1,400,000	1,680,000	1.20	.....	.....
1887.....	1,596,879	2,235,631	1.40	.....	.....
1888.....	1,850,000	2,775,000	1.50	.....	.....
1889.....	2,221,043	3,296,888	1.48	.....	5,956
1890.....	2,259,922	2,947,517	1.30	210	4,523
1891.....	2,716,705	3,557,305	1.31	222	6,201
1892.....	3,007,276	3,955,595	1.31½	208	6,559
1893.....	2,652,546	3,375,740	1.27	147	7,310
1894.....	3,388,251	4,178,998	1.23	164	7,339
1895.....	2,926,870	3,481,981	1.20	159	7,482
1896.....	2,884,801	3,295,032	1.15	168	7,127
1897.....	3,054,012	3,602,326	1.18	194	6,639
1898.....	3,406,555	3,703,014	1.09	194	7,197

KENTUCKY.

Total product in 1898, 3,887,908 short tons; spot value, \$3,084,551.

Kentucky was one of the twenty-two States whose coal product in 1898 was the largest on record. Compared with 1897, the product in 1898 showed an increase of 285,811 short tons, or 7.9 per cent, with an increase in value of over \$256,000, practically in direct proportion to the increase in tonnage.

Kentucky is the only State in the Union whose coal product is obtained from any two of the great fields. The Appalachian field crosses the eastern end of the State, and the central or Illinois field has its southern extremity in the western part. As will be seen in a subsequent table, the western field contributed about 60 per cent of the total output in the last two years; but 60 per cent of the increase in 1898 was from the eastern field.

The statistics relating to the use of mining machines in the State have not been completely obtained for 1898, as a few operators have failed to reply to the inquiries on this subject. From the incomplete data, however, it appears that there was a slight decrease in the number of machines in use, while the product won by machines was approximately 1,400,000 short tons, an increase of about 100,000 tons over 1897.

There were 12 mines at which strikes occurred in 1898. The longest one lasted five months, the shortest one two days. The total number

of men made idle was 842, who lost an average of 52 days each, entailing a total loss of 43,899 working days.

As will be seen in the following tables, Hopkins County is by far the largest producer, with a product, both in 1897 and 1898, approaching close to 1,000,000 short tons. Ohio County, second, had an average product of about 450,000 tons for the two years. Both of these counties are in the western field, and both showed a slightly decreased output in 1898. Whitley County, in the eastern field, ranks third in importance. Its product in 1898 was 145,402 tons larger than in 1897, the comparatively small output in 1897 being due to a six-months' strike in 8 of the 12 mines of the county and affecting a total of 1,000 men. Laurel, Knox, and Boyd counties, in the eastern field, and Union County, in the western field, follow Whitley County in the order named, the two former having a product of nearly 300,000 tons each in 1898. Boyd County slightly exceeded 200,000 tons and Union County was about 6,000 tons short of that figure. The details of production in 1897 and 1898 were as follows:

Coal product of Kentucky in 1897, by counties.

County.	Num- ber of mines.	Loaded at mines for ship- ment.	Sold to local trade and used by em- ployees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Aver- age price per ton.	Aver- age num- ber of days active.	Aver- age number of em- ployees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Bell.....	7	99,720	2,075	1,466	.....	103,261	\$146,409	\$1.42	255	269
Boyd.....	2	89,522	101,596	1,420	.....	192,538	137,760	.72	264	325
Butler.....	2	11,355	10,452	40	.....	21,847	19,009	.87	143	85
Carter.....	7	94,377	23,414	1,555	.....	124,346	114,416	.92	221	406
Hancock....	3	16,566	832	304	.....	17,702	26,818	1.51	161	97
Henderson..	5	77,557	27,240	2,890	.....	107,187	93,884	.88	214	215
Hopkins....	8	887,146	31,997	16,464	50,805	976,412	631,016	.65	208	1,414
Johnson....	2	8,911	630	.....	.....	9,541	24,422	2.56	178	68
Knox.....	5	153,750	1,505	3,190	.....	158,445	118,004	.74	169	282
Laurel.....	14	346,967	15,254	2,086	.....	364,307	298,957	.82	195	879
Lee.....	3	34,556	1,055	100	.....	35,711	36,997	1.04	192	61
McLean.....	2	32,360	500	500	.....	33,360	23,720	.71	246	70
Muhlenberg	8	252,170	13,860	4,730	.....	270,760	183,841	.68	171	632
Ohio.....	8	452,001	6,980	7,864	.....	466,845	301,131	.65	192	745
Pulaski.....	6	59,415	610	425	.....	60,450	60,130	.99	104	338
Rockcastle..	5	110,885	10,003	1,980	4,023	126,896	89,909	.71	158	344
Webster....	4	60,310	4,017	1,655	.....	65,982	46,623	.71	171	129
Whitley....	12	235,272	3,645	2,974	.....	241,891	222,542	.92	104	1,298
Breathitt...	3	21,953	3,100	1,200	.....	26,253	27,743	1.06	125	97
Christian...	3	43,339	384	5,190	.....	48,913	37,499	.77	156	129
Daviess....	3	43,339	384	5,190	.....	48,913	37,499	.77	156	129
Greenup....	3	43,339	384	5,190	.....	48,913	37,499	.77	156	129
Lawrence...	3	43,339	384	5,190	.....	48,913	37,499	.77	156	129
Small mines.	.....	.....	150,000	.....	.....	150,000	187,500	.....	.....	.....
Total.....	109	3,088,132	404,099	55,083	54,833	3,002,097	2,828,329	.79	178	7,983

Coal product of Kentucky in 1898, by counties.

County.	Num- ber of mines.	Loaded at mines for ship- ment.	Sold to local trade and used by em- ployees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Aver- age price per ton.	Aver- age num- ber of days active.	Average number of em- ployees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Bell	8	79,539	4,243	1,562	100	85,544	\$109,782	\$1.28	151	271
Boyd	2	204,896	1,141	2,785	.....	208,762	154,584	.74	228	280
Butler	2	29,586	4,480	.....	48	34,114	48,084	1.35	146	124
Carter	7	62,576	269	900	.....	63,745	58,961	.92	158	220
Hancock	2	9,390	60	.....	.....	9,450	15,064	1.60	243	53
Henderson..	5	71,020	14,295	1,060	.....	86,395	69,847	.81	201	200
Hopkins....	12	886,769	23,478	23,216	41,496	974,959	623,758	.64	214	1,583
Johnson....	2	11,937	279	.....	.....	12,216	31,066	2.54	241	83
Knox	4	280,348	627	900	.....	281,875	215,217	.76	253	334
Laurel	13	286,690	699	1,069	.....	288,478	230,707	.80	197	778
Lawrence...	2	45,921	9,389	4,290	.....	59,600	42,938	.72	224	118
Lee	3	24,916	680	200	.....	25,796	24,950	.97	254	66
McLean	3	21,715	10	.....	.....	21,725	16,364	.75	112	49
Muhlenberg	9	309,346	3,330	4,726	.....	317,392	229,540	.72	148	689
Ohio	9	429,575	4,250	6,186	.....	440,011	278,090	.68	179	812
Pulaski....	6	84,815	640	1,315	.....	86,770	79,281	.91	175	301
Union	7	183,847	5,898	4,420	.....	193,665	154,593	.80	137	456
Webster....	3	50,229	5,001	670	.....	55,850	36,478	.65	179	117
Whitley....	12	377,373	7,929	1,977	.....	387,284	259,393	.91	165	945
Christian...}	3	66,496	17,141	.....	.....	83,637	101,221	1.21	225	136
Daviess....}										
Breathitt...}	2	20,500	200	240	.....	20,940	19,158	.91	137	60
Greenup....}										
Small mines	.....	.....	150,000	.....	.....	150,000	187,500	.....	.....	.....
Total ..	116	3,537,429	253,629	55,206	41,644	3,887,908	3,084,551	.79	187	7,614

Distribution of the coal product of Kentucky from 1889 to 1898.

Year.	Num- ber of mines.	Loaded at mines for shipment.	Sold to local trade and used by em- ployees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Aver- age price per ton.	Aver- age num- ber of days active.	Average number of em- ployees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
1889.....		2,111,010	246,306	23,961	18,458	2,399,735	\$2,374,839	\$0.98	.....	.....
1890.....		2,387,989	291,666	29,568	22,273	2,701,496	2,472,119	.92	219	5,259
1891.....		2,559,268	285,281	21,363	50,162	2,916,069	2,715,600	.93	225	6,355
1892.....		2,620,556	327,965	33,856	42,916	3,025,313	2,771,238	.92	217	6,724
1893.....		2,613,645	281,115	30,969	81,450	3,007,179	2,613,569	.86	202	6,581
1894.....		2,734,847	281,235	47,344	47,766	3,111,192	2,749,932	.88	145	8,063
1895... 120		3,012,610	254,028	50,294	40,838	3,357,770	2,890,247	.86	153	7,799
1896... 112		2,980,355	251,897	55,447	45,779	3,333,478	2,684,306	.78	165	7,549
1897... 109		2,068,132	404,099	55,033	54,833	3,602,097	2,828,329	.79	178	7,983
1898... 116		3,537,429	253,629	55,206	41,644	3,887,908	3,084,551	.79	187	7,614

In the following table is presented the total output, by counties, in 1896, 1897, and 1898, with the increases and decreases in 1898 as compared with the preceding year:

Coal product of Kentucky since 1896, by counties.

County.	1896.	1897.	1898.	Increase in 1898.	Decrease in 1898.
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
Bell	89,534	103,261	85,544	.....	17,717
Boyd	121,022	192,538	206,762	16,224	.....
Butler	28,444	21,847	34,114	12,267	.....
Carter	136,066	124,346	63,745	.....	60,601
Breathitt	2,406	10,053	.....	.....	.....
Christian	13,124	13,000	104,577	77,472	.....
Daviess	3,232	3,200	.....	.....	.....
Greenup	854	852	.....	.....	.....
Hancock	17,842	17,702	9,450	.....	8,252
Henderson	119,540	107,187	86,395	.....	20,792
Hopkins	777,182	976,412	974,959	.....	1,453
Johnson	6,762	9,541	12,216	2,675	.....
Knox	217,040	158,445	281,575	123,130	.....
Laurel	288,494	364,307	288,478	.....	75,829
Lawrence	47,474	48,061	59,600	11,539	.....
Lee	9,847	35,711	25,796	.....	9,915
McLean	24,076	33,360	21,725	.....	11,635
Muhlenberg	256,268	270,760	317,392	46,632	.....
Ohio	368,094	466,295	440,011	.....	26,284
Pulaski	72,537	47,847	86,770	38,923	.....
Rockcastle .....	.....	12,603	.....	.....	12,603
Union	104,122	126,896	193,665	66,769	.....
Webster	50,538	65,982	55,850	.....	10,132
Whitley	428,980	241,891	387,284	145,393	.....
Small mines	150,000	150,000	150,000	.....	.....
Total	3,333,478	3,602,097	3,887,908	a 285,811	.....

a Net increase.

In further illustration of the distribution of Kentucky's coal product, the following tables exhibiting the output from the two fields, by counties, in 1897 and 1898, with increases and decreases in 1898, is given:

Coal product of the eastern district of Kentucky in 1897 and 1898, exclusive of small mines.

County.	1897.	1898.	Increase in 1898.	Decrease in 1898.
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
Bell	103,261	85,544	.....	17,717
Boyd	192,538	208,762	16,224	.....
Breathitt	10,053	18,440	8,387	.....
Carter	124,346	63,745	.....	60,601
Greenup	852	2,500	1,648	.....
Johnson	9,541	12,216	2,675	.....
Knox	158,445	281,575	123,130	.....
Laurel	364,307	288,478	.....	75,829
Lawrence	48,061	59,600	11,539	.....
Lee	35,711	25,796	.....	9,915
Pulaski	47,847	86,770	38,923	.....
Rockcastle	12,603	.....	.....	12,603
Whitley	241,891	387,284	145,393	.....
Total	1,349,456	1,520,710	a 171,254	.....

a Net increase.

Coal product of the western district of Kentucky in 1897 and 1898, exclusive of small mines.

County.	1897.	1898.	Increase in 1898.	Decrease in 1898.
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
Butler	21,847	34,114	12,267	
Christian	13,000	66,496	53,496	
Daviess	3,200	17,141	13,941	
Hancock	17,702	9,450		8,252
Henderson	107,187	86,395		20,792
Hopkins	976,412	974,959		1,453
McLean	33,360	21,725		11,635
Muhlenberg	270,760	317,392	46,632	
Ohio	466,295	440,011		26,284
Union	126,896	193,665	66,769	
Webster	65,982	55,850		10,132
Total	2,102,641	2,217,198	114,557	

^a Net increase.

The following table exhibits the annual product of the State since 1873:

Annual coal product of Kentucky since 1873.

Year.	Short tons.	Year.	Short tons.
1873.....	300,000	1886.....	1,550,000
1874.....	360,000	1887.....	1,933,185
1875.....	500,000	1888.....	2,570,000
1876.....	650,000	1889.....	2,399,755
1877.....	850,000	1890.....	2,701,496
1878.....	900,000	1891.....	2,916,069
1879.....	1,000,000	1892.....	3,025,313
1880.....	1,000,000	1893.....	3,007,179
1881.....	1,100,000	1894.....	3,111,192
1882.....	1,300,000	1895.....	3,357,770
1883.....	1,650,000	1896.....	3,333,478
1884.....	1,550,000	1897.....	3,602,097
1885.....	1,600,000	1898.....	3,887,908

MARYLAND.

Total product in 1898, 4,674,884 short tons; spot value, \$3,532,257.

The coal product of Maryland has increased each year since 1894, the output in 1898 being 232,756 short tons larger than in 1897, with a corresponding increment in value, 531,000 tons more than in 1896, 769,299 tons more than in 1895, and 1,173,456 tons more than in 1894. The product in 1898 was accordingly the largest on record, Maryland being one of the 22 States whose coal output reached its maximum in 1898. An interesting illustration of the growth of the coal mining industry in Maryland in the past few years is shown by dividing the period from 1883 to 1898, inclusive, into four, and taking the average for each fourth. In the four years 1883 to 1886, inclusive, the average yearly product was 2,648,150 short tons; the average for the next four years was 3,263,755 short tons, an increase of 615,605 short tons; for the next four years, which included the panic years of 1893 and 1894, the average was 3,614,418 short tons, a gain of about 350,000 short tons; while in the final four years the average product was 4,294,133 short tons, an increase of nearly 680,000 tons. The average output in the last four years, of the period was about 1,646,000 tons, or 62 per cent more than that of the first four years.

Pick mining is exclusively practiced in Maryland, and miners in that State have not been called upon to compete with machines in winning their coal, except so far as machine-mined coal in other States competes with the pick-mined coal of this State. This competition, indirect as it is to the miners, is felt in a direct and very perceptible manner by the operators, who, in order to market their product, have been obliged to lower the price until in ten years there has been a decline of 20 per cent—from 95 cents in 1887 to 76 cents in 1897 and 1898.

The records of the shipments of coal from the Maryland field and that of the Piedmont region in West Virginia (all embraced in the "Cumberland coal field") have been carefully preserved since 1842, a period of fifty-seven years. Reports of the Cumberland coal trade are published annually, and are shown on a subsequent page. It appears from the report for 1898 that the shipments from the region since 1842 have aggregated 103,594,198 long tons, or 116,025,502 short tons, of which 85,754,614 long tons, or 96,045,168 short tons, have come from the Frostburg or Maryland portion of the field. The local trade and colliery consumption are unimportant factors in this field, aggregating about 2 per cent of the shipments. Adding for this factor, say, 2,000,000 tons, the total yield of the Maryland field to date is found to have been approximately 98,000,000 short tons.

Coal mining in Maryland is confined to two counties, Allegany and Garrett, the former being by far the more important. Of the product in 1897 Garrett County produced 79,924 short tons, or not quite 2 per cent of the total. In 1898 Garrett County produced 175,493 short tons, or not quite 4 per cent of the total.

The following table shows the statistics of production in Maryland since 1889. The figures are reduced to short tons for the sake of uniformity throughout the report.

Coal product of Maryland since 1889.

Year.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Total product.	Total value.	Average price per ton.	Average number of days active.	Average number of employees.
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
1889.....	2,885,336	44,217	10,162	2,939,715	\$2,517,474	\$0.86	.....	3,702
1890.....	3,296,393	52,621	8,799	3,357,813	2,899,572	.86	244	2,842
1891.....	3,771,584	36,959	11,696	3,820,239	3,082,515	.80	244	3,891
1892.....	3,385,384	30,955	8,628	3,419,962	3,063,580	.89	225	3,886
1893.....	3,676,137	26,883	13,071	3,716,041	3,267,317	.88	240	3,935
1894.....	3,435,600	51,750	14,078	3,501,428	2,687,270	.77	215	3,974
1895.....	3,840,991	59,950	14,644	3,915,585	3,160,592	.81	248	3,912
1896.....	4,068,558	53,046	22,832	4,143,936	3,299,928	.80	204	4,039
1897.....	4,391,703	27,762	22,663	4,442,128	3,363,996	.76	262	4,719
1898.....	4,618,990	36,941	18,958	4,674,884	3,532,257	.76	253	4,818

The following table shows the annual output of coal in Maryland since 1883:

Product of coal in Maryland from 1883 to 1897.

Year.	Short tons.	Value.	Average price per ton.	Average number of days active.	Average number of men employed.
1883.....	2,476,075	.....	.....	.....	.....
1884.....	2,765,617	.....	.....	.....	.....
1885.....	2,833,337	.....	.....	.....	.....
1886.....	2,517,577	\$2,391,698	\$0.95	.....	.....
1887.....	3,278,023	3,114,122	.95	.....	.....
1888.....	3,479,470	3,293,070	.95	.....	.....
1889.....	2,939,715	2,517,474	.86	.....	3,702
1890.....	3,357,813	2,899,572	.86	244	2,842
1891.....	3,820,239	3,082,515	.80	244	3,891
1892.....	3,419,962	3,063,580	.89	225	3,886
1893.....	3,716,041	3,267,317	.88	240	3,935
1894.....	3,501,428	2,687,270	.77	215	3,974
1895.....	3,915,585	3,160,592	.81	248	3,912
1896.....	4,143,936	3,299,928	.80	204	4,039
1897.....	4,442,128	3,363,996	.76	262	4,719
1898.....	4,674,884	3,532,257	.76	253	4,818

It will be observed from the foregoing tables that there was a slight increase in the number of men employed and a slight decrease in the average working time in 1898 as compared with the preceding year. An observable deduction obtained from these results is that the average tonnage per man increased from 941 in 1897 to 970 in 1898. Moreover, the average tonnage per man per day was increased from 3.59 to 3.83, so that the decline in price previously referred to has been partly made up in the increased efficiency and productive capacity per employee.

The following table, showing the total shipments from the Cumberland field (including the West Virginia mines in the field) since 1842, is obtained from the official reports of the Cumberland coal trade. The Maryland mining laws compel the use of the long ton as a basis of measurement, and the quantities in these tables are so expressed.

Total shipments from the Cumberland coal field in

Year.	Frostburg region.						
	Cumberland and Pennsylvania R. R.				Cumberland Coal and Iron Company's railroad.		
	By Baltimore and Ohio R. R.	By Chesapeake and Ohio Canal.	By Pennsylvania R. R.	Total.	By Baltimore and Ohio R. R.	By Chesapeake and Ohio Canal.	Total.
	Long tons.	Long tons.	Long tons.	Long tons.	Long tons.	Long tons.	Long tons.
1842	757			757	951		951
1843	3,661			3,661	6,421		6,421
1844	5,156			5,156	9,784		9,784
1845	13,738			13,738	10,915		10,915
1846	11,240			11,240	18,555		18,555
1847	20,615			20,615	32,326		32,326
1848	36,571			36,571	43,000		43,000
1849	68,676			68,676	78,778		78,778
1850	73,783			73,783	119,029		119,029
1851	70,893	5,137		76,030	103,808	81,540	185,348
1852	123,534	46,357		170,891	139,325	19,862	159,287
1853	150,881	84,060		234,941	155,278	70,535	225,813
1854	148,953	63,731		212,684	178,580	92,114	269,694
1855	93,661	77,085		170,746	97,710	100,691	198,401
1856	86,984	80,587		167,571	121,945	105,149	227,094
1857	80,743	55,174		135,917	88,573	54,000	142,573
1858	48,018	166,712		214,730	66,009	87,539	153,548
1859	48,415	211,639		260,054	72,423	96,203	168,626
1860	70,609	232,378		302,987	80,500	63,600	144,100
1861	23,878	68,803		92,681	25,983	29,296	55,279
1862	71,745	75,206		146,951	41,096	23,478	64,574
1863	117,796	178,269		296,065	111,087	43,523	154,610
1864	287,126	194,120		481,246	67,676	64,522	132,198
1865	384,297	235,295		619,592	104,651	57,907	162,558
1866	592,938	291,019		883,957	52,251	52,159	104,410
1867	623,031	385,249		1,008,280	40,106	72,904	113,010
1868	659,115	424,406		1,083,521	100,845	57,919	158,764
1869	1,016,777	573,243		1,590,020	130,017	78,908	208,925
					2,092,680	1,192,224	3,284,884
Eckhart Branch R. R.							
1870	909,511	520,196		1,429,707	114,404	83,941	198,345
1871	1,247,279	656,085		1,903,364	60,864	194,254	255,118
1872	1,283,956	612,537	22,021	1,918,514	26,586	203,666	230,252
1873	1,509,570	641,220	114,589	2,265,379	89,785	137,562	227,347
1874	1,296,804	631,882	67,671	1,995,357	113,670	135,182	248,852
1875	1,095,880	715,673	160,213	1,971,766	52,505	164,165	216,670
1876	939,262	443,435	131,866	1,514,563	15,285	189,005	204,290
1877	755,278	473,646	170,884	1,399,808	63,181	111,350	174,531
1878	823,801	486,038	145,864	1,455,703	90,455	123,166	213,621
1879	933,240	397,009	154,264	1,484,513	141,907	104,238	246,145
1880	1,055,491	471,800	213,446	1,740,737	197,525	131,325	328,850
1881	1,113,263	270,156	153,501	1,536,920	271,570	151,526	423,096
1882	576,701	115,244	91,574	783,519	199,183	76,140	275,323
1883	851,985	302,678	217,065	1,371,728	197,235	141,390	338,625
1884	1,198,780	150,471	199,138	1,548,389	289,864	124,718	414,582
1885	1,091,904	171,460	206,227	1,469,591	289,407	117,829	407,236
1886	1,131,949	115,531	141,520	1,389,000	343,321	113,791	457,112
1887	1,584,114	132,177	176,241	1,892,532	332,798	125,805	458,603
1888	1,660,406	156,216	193,046	2,009,668	374,888	95,191	470,079
1889	1,480,381	26,886	177,152	1,684,419	368,497	26,407	394,904
1890	1,511,418		391,704	1,903,122	522,334		522,334
1891	1,628,574	9,070	289,232	1,926,876	468,142	89,294	557,436
1892	1,426,964	93,705	214,011	1,734,710	349,207	170,116	519,323
1893	1,332,634	135,409	360,807	1,828,850	341,321	201,947	543,268
1894	1,068,732	95,523	372,205	1,536,460	436,216	208,914	645,130
1895	1,193,834	101,076	255,133	1,550,043	464,407	212,534	676,941
1896	1,844,402	169,195	163,471	2,177,068	610,418	195,279	805,697
1897	1,790,813	96,536	169,679	2,057,028	586,592	166,691	753,283
1898	2,181,626	24,697	116,195	2,272,518	507,196	213,139	720,335
Total	40,845,780	11,757,699	4,968,719	57,571,598	7,831,763	3,957,985	11,789,748

a Includes 138,593 tons used on line of Cumberland and Pennsylvania Railroad and its branches pany in locomotives, rolling mills, etc.

Frostburg region.				Piedmont region.		Total.			
Georges Creek and Cumberland R. R.				Georges Creek R. R.	Hampshire R. R. by Baltimore and Ohio R. R.	Baltimore and Ohio R. R. and local.	Chesapeake and Ohio Canal.	Pennsylvania R. R.	Aggregate.
By Chesapeake and Ohio Canal.	By Pennsylvania R. R.	Local and Baltimore and Ohio.	Total.						
Long tons.	Long tons.	Long tons.	Long tons.	Long tons.	Long tons.	Long tons.	Long tons.	Long tons.	Long tons.
						1,708			1,708
						10,082			10,082
						14,890			14,890
						24,653			24,653
						29,795			29,795
						52,940			52,940
						79,571			79,571
						142,449			142,449
						192,806	4,042		196,848
						174,701	82,978		256,679
						268,459	65,719		334,178
						376,219	157,760		533,979
				73,725		503,836	155,845		659,681
				181,803		478,486	183,796		662,272
				227,245	65,570	502,330	204,120		706,450
				260,210	42,765	465,912	116,574		582,486
				252,368	51,628	395,405	254,251		649,656
				218,318	63,060	426,512	297,842		724,354
				257,740	47,934	493,031	295,878		788,909
				289,298	52,564	172,075	97,599		269,674
				85,554	36,660	218,950	98,684		317,634
				69,482	36,627	531,553	216,792		748,345
				266,430	44,552	399,354	258,642		657,996
					71,345	560,293	343,202		903,495
					90,964	736,153	343,178		1,079,331
					72,532	736,069	458,153		1,193,822
					88,658	848,118	482,325		1,330,443
					83,724	1,230,518	662,151		1,892,669
				2,190,673					
				Empire and West Virginia mines.					
				28,035	60,988	1,112,938	604,187		1,717,075
				81,218	96,453	1,404,814	850,339		2,345,153
				85,441	121,364	1,517,347	816,103	22,021	2,355,471
				77,582	103,793	1,780,710	778,802	114,589	2,674,101
				57,492	109,184	1,576,160	787,084	67,671	2,410,895
				63,537	90,800	1,302,237	879,838	160,098	2,342,773
				108,723	7,505	1,077,775	632,440	131,866	1,835,081
						818,459	584,996	170,884	1,574,339
						924,254	609,204	145,864	1,679,322
					998	1,075,198	501,247	154,264	1,730,709
					51	1,319,589	603,125	213,446	2,136,160
				66,573	88,722	1,478,502	504,818	278,598	2,261,918
				277,929	277,929	1,085,249	269,782	185,435	1,540,466
				338,001	338,001	1,444,766	680,119	419,288	2,544,173
				496,928	496,928	2,283,928	344,954	356,097	2,984,979
				403,489	403,489	2,076,485	368,744	420,745	2,865,974
				346,308	346,308	2,069,774	282,802	239,891	2,562,467
				449,011	449,011	2,724,347	262,345	389,104	

and at Cumberland and Piedmont; also 480,316 tons used by the Baltimore and Ohio Railroad Com-

20 GEOL. PT 6—28

MICHIGAN.

Total product in 1898, 315,722 short tons; spot value, \$462,711.

The unusual activity in the development of Michigan coal mines, which began in 1897, referred to in the report for that year, continued with increased force in 1898. The number of producing mines, which increased from 11 in 1896 to 13 in 1897, rose to 17 in 1898, while 8 more mines were being opened up at the end of the year but had not begun shipping. The product in 1897, the largest up to that time, was nearly twice that of 1895, the year of largest output since 1882, the banner year prior to 1897.

The product in 1898 amounted to 315,722 short tons, an increase of 92,130 short tons, or more than 40 per cent, a rate of increase rivaled only by that of Arkansas, whose increase in 1898 was 10 per cent more than the total product of Michigan. The fact that new mines, not reaching the productive stage before January 1, 1899, equal in number to 50 per cent of the producing, will, if present favorable industrial conditions continue throughout the year, add to the production in 1899 and make it possible for the output this year to attain a total of 500,000 tons.

While the coal product of Michigan will necessarily be limited to a comparatively local market, on account of the competition with coal from the more highly developed fields of Pennsylvania, Ohio, Indiana, and Illinois, the rapidly increasing manufacturing industries in the lake cities near at hand have attracted the attention of capital to coal mining in this hitherto almost neglected field. Some of the new enterprises are backed by men who have had long experience as operators in the coal fields of other States, which encourages the belief that the activity is of a substantial nature, and not of that order known as "booms."

Two or three unimportant strikes occurred during the year. They had no material effect upon the production. Mining machines, 7 in number, were installed in one mine during the latter part of year. The product by their use was small, amounting to less than 1,500 tons.

The production in Michigan by counties in 1897 and 1898 was as follows:

Coal product of Michigan in 1897, by counties.

County.	Num- ber of mines.	Loaded at mines for ship- ment.	Sold to local trade and used by em- ployees.	Used at mines for steam and heat.	Total product.	Total value.	Aver- age price per ton.	Aver- age num- ber of days active.	Aver- age num- ber of em- ployees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Bay.....	2	54,783	396	1,850	57,029	\$87,327	\$1.53	227	124
Eaton.....	3	952	2,770	65	3,787	6,750	1.78	188	26
Genesee.....	2	18,761	3,873	2,125	24,759	34,475	1.39	208	73
Huron.....									
Jackson.....	4	58,050	12,681	5,290	75,961	101,921	1.34	223	181
Saginaw.....	2	56,090	4,966	1,000	62,056	94,943	1.53	258	133
Shiawassee..									
Total..	13	188,636	24,686	10,270	223,592	325,416	1.46	230	537

Coal product of Michigan in 1898, by counties.

County.	Num- ber of mines.	Loaded at mines for ship- ment.	Sold to local trade and used by em- ployees.	Used at mines for steam and heat.	Total product.	Total value.	Aver- age price per ton.	Aver- age num- ber of days active.	Aver- age num- ber of em- ployees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Bay.....	2	45,601	49,944	1,268	96,813	\$127,121	\$1.31	285	175
Eaton.....	4	.....	5,936	10	5,946	10,596	1.78	149	29
Genesee.....	2	12,775	1,715	1,550	16,040	21,845	1.33	199	48
Huron.....									
Jackson.....	2	24,000	14,104	2,287	40,391	64,092	1.59	261	110
Saginaw.....	5	123,867	405	630	124,902	192,112	1.54	237	246
Shiawassee.....	2	25,912	3,518	2,200	31,630	47,445	1.50	207	107
Total.....	17	232,155	75,622	7,945	315,723	462,711	1.47	245	715

The following tables show the details of production in Michigan for the past seven years and the total output since 1877:

Coal product of Michigan for seven years.

Year.	Loaded at mines for ship- ment.	Sold to local trade and used by em- ployees.	Used at mines for steam and heat.	Total product.	Total value.	Aver- age price per ton.	Aver- age number of days active.	Aver- age number of em- ployees.
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
1892.....	27,200	45,180	5,610	77,990	\$121,314	\$1.56	230	195
1893.....	27,797	16,867	1,825	45,979	82,462	1.79	154	162
1894.....	60,817	7,055	2,150	70,022	103,049	1.47	224	223
1895.....	80,403	27,019	4,900	112,322	180,016	1.60	186	320
1896.....	83,150	6,547	3,185	92,882	150,631	1.62	157	320
1897.....	188,636	24,686	10,270	223,592	325,416	1.46	230	537
1898.....	232,155	75,622	7,945	315,723	462,711	1.47	245	715

Coal product of Michigan from 1877 to 1898.

Year.	Short tons.	Year.	Short tons.
Previous to 1877.....	350,000	1888.....	81,407
1877.....	69,197	1889.....	67,431
1878.....	85,322	1890.....	74,977
1879.....	82,015	1891.....	80,307
1880.....	129,063	1892.....	77,990
1881.....	130,130	1893.....	45,979
1882.....	135,339	1894.....	70,022
1883.....	71,296	1895.....	112,322
1884.....	36,712	1896.....	92,882
1885.....	45,178	1897.....	223,592
1886.....	60,434	1898.....	315,722
1887.....	71,461		

MISSOURI.

Total product in 1898, 2,688,321 short tons; spot value, \$2,871,296.

Although the output of coal in Missouri in 1898 was larger than that of any of the four years immediately preceding, there were a number of instances in the past history of the State when the coal product exceeded that of last year. Influences which have militated against the coal-mining industry of Missouri have been discussed in previous reports. Most important among these is the proximity of the coal fields in adjoining States. The fuel supply of St. Louis and other cities of the eastern part of the State is drawn almost exclusively from the coal fields of Illinois. Iowa on the north, Kansas on the west, the Indian Territory at the southwest, Arkansas on the south, and western Kentucky at the southeast, all have large areas of coal well developed, which not only prevent the exportation of Missouri coal, but actually invade markets naturally tributary to the Missouri mines.

The comparatively stationary condition of Missouri's coal-mining industry in a year of generally increased production can not be attributed to labor troubles, for while strikes occurred at 15 different mines, they were, with two exceptions, settled within ten days. The longest one lasted seventy-one days and made 70 men idle for that time. The next longest also affected 70 men, who were idle twenty-eight days. One strike lasted only two days, three more three days, two lasted four days, two six days, and the others from eight to ten days. It would seem that the long, bitterly contested strike in Illinois, which reduced the product of that State about 1,500,000 tons, would have had the effect of materially increasing Missouri's production, but such was not the case, although decisive losses were shown in the Illinois counties contiguous to St. Louis and the eastern portion of the State.

Mining machines are used in one mine only in the State and the coal undercut by machines in 1898 was a little less than in the preceding year.

Macon County is the most important producer, yielding somewhat more than one-fourth the total product in 1898. Bates County, second, produced about 12 per cent of the total, followed closely by Lafayette. Randolph County contributed a little over 9 per cent and Ray County about 8 per cent. The production of the State in 1897 and 1898, by counties, with the distribution of the product, is shown in the following tables:

COAL.

437

Coal product of Missouri in 1897, by counties.

County.	Num- ber of mines.	Loaded at mines for ship- ment.	Sold to local trade and used by em- ployees.	Used at mines for steam and heat.	Total product.	Total value.	Aver- age price per ton.	Aver- age num- ber of days active.	Aver- age num- ber of em- ployees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Adair	3	33,511		300	33,811	\$35,618	\$1.05	150	135
Audrain	3	93,673	5,161	1,538	100,372	118,582	1.18	272	250
Barton									
Bates	9	324,276	5,087	6,415	335,778	297,166	.89	133	529
Boone	3	4,874	4,274	82	9,180	11,650	1.27	169	49
Callaway	7	4,000	24,960	158	29,118	48,597	1.67	219	87
Grundy	2	33,097	5,435	2,066	40,598	68,882	1.70	191	172
Henry	8	42,413	1,404	459	44,276	60,721	1.37	217	165
Lafayette	24	298,605	22,117	5,076	325,798	424,797	1.30	188	1,108
Linn	5	71,856	9,044	698	81,598	118,799	1.46	217	229
Macon	10	561,710	2,131	9,715	573,556	499,283	.87	182	1,283
Montgomery	2	18,000	1,505	360	19,865	22,956	1.16	214	49
Putnam	3	99,785	1,201	1,936	102,922	111,529	1.08	225	330
Randolph	8	296,421	12,151	2,527	311,099	309,164	.99	212	737
Ray	9	172,200	6,967	3,073	182,240	242,141	1.33	155	642
Vernon	3	273,232	1,209	4,590	279,031	263,065	.94	188	393
Caldwell	2	32,200	10,500	600	43,300	71,820	1.66	258	112
Cole									
Jackson	2	15,834	6,340	1,500	23,674	37,278	1.57	241	108
Morgan									
Pettis	2	9,200	200	100	9,500	11,836	1.25	191	35
Ralls									
Small mines			120,000		120,000	140,000			
Total	105	2,384,797	239,636	41,143	2,665,626	2,887,884	1.08	168	6,414

Coal product of Missouri in 1898, by counties.

County.	Number of mines.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Total product.	Total value.	Average price per ton.	Average number of days active.	Average number of employees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Adair.....	3	73,606	145	1,045	74,796	\$75,579	\$1.01	207	230
Audrain.....	3	27,200	3,066	710	30,976	35,702	1.15	237	77
Barton.....	5	63,010	6,294	1,247	70,551	84,411	1.20	293	164
Bates.....	13	308,793	4,815	5,365	318,973	285,111	.89	150	605
Boone.....	3	7,900	5,519	360	13,779	15,980	1.16	177	48
Callaway.....	9	.....	21,210	5	21,215	33,036	1.56	178	86
Grundy.....	2	31,691	6,050	1,791	39,532	68,247	1.73	223	173
Henry.....	15	29,638	9,392	52	39,082	54,191	1.39	180	207
Lafayette.....	24	279,385	18,007	3,204	301,006	399,918	1.33	168	1,001
Linn.....	5	59,726	7,979	938	68,643	100,931	1.47	182	241
Macon.....	12	723,596	4,283	14,534	742,413	638,510	.86	227	1,465
Putnam.....	4	114,900	892	1,767	117,059	132,122	1.04	236	365
Randolph.....	7	242,222	9,143	2,193	253,558	254,808	1.00	223	581
Ray.....	9	195,095	12,481	3,385	210,961	265,845	1.26	192	690
Vernon.....	4	174,703	2,086	4,548	181,337	168,941	.93	114	342
Caldwell and Cole...	2	22,000	4,000	1,000	27,000	41,000	1.52	222	102
Jackson and Johnson	2	31,900	8,600	3,200	43,700	69,325	1.59	223	126
Livingston, Montgomery, and Ralls..	3	7,480	6,200	.....	13,680	17,639	1.29	233	39
Small mines.....	.....	.....	120,000	.....	120,000	140,000	.....	.....	.....
Total.....	124	2,393,315	249,662	45,344	2,688,321	2,871,296	1.07	198	6,542

Distribution of the coal product of Missouri from 1889 to 1898.

Year.	Number of mines.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Total product.	Total value.	Average price per ton.	Average number of days active.	Average number of employees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
1889.....		2,246,845	275,999	34,979	2,557,823	\$3,479,057	\$1.36	.....	.....
1890.....		2,449,305	240,237	45,679	2,735,221	3,382,858	1.24	229	5,971
1891.....		2,350,707	265,595	58,304	2,674,606	3,283,242	1.23	218	6,199
1892.....		2,399,605	293,414	40,930	2,733,949	3,369,659	1.23	230	5,893
1893.....		2,525,227	322,754	49,461	2,897,442	3,562,757	1.23	206	7,375
1894.....	149	1,955,255	242,501	47,283	2,245,039	2,634,564	1.17	188	7,523
1895.....	124	2,104,452	231,090	36,851	2,372,393	2,651,612	1.12	163	6,299
1896.....	128	2,047,251	243,029	41,262	2,331,542	2,518,194	1.08	168	5,982
1897.....	105	2,384,797	239,696	41,143	2,665,626	2,887,884	1.08	168	6,414
1898.....	124	2,393,315	249,662	45,344	2,688,321	2,871,296	1.07	198	6,542

The following table presents the statistics of county production for four years, with the increase and decrease in 1898 as compared with 1897:

Coal product of Missouri since 1895, by counties.

[Short tons.]

County.	1895.	1896.	1897.	1898.	Increase in 1898.	Decrease in 1898.
Adair	23,038	25,738	33,811	74,796	40,985	.....
Andrain	38,386	21,857	45,972	30,976	.....	14,996
Barton	51,400	13,731	54,400	70,551	16,151	.....
Bates	354,741	452,435	335,778	318,973	.....	16,805
Boone	15,180	14,751	9,180	13,779	4,599	.....
Caldwell	16,980	21,800	40,800	25,000	.....	15,800
Callaway	19,169	40,709	29,118	21,215	.....	7,903
Cole .....	.....	.....	2,500	2,000	.....	500
Cooper	225	.....	.....	.....	.....	.....
Grundy	29,340	34,602	40,508	39,532	.....	976
Henry	55,428	35,505	44,276	39,082	.....	5,194
Jackson	21,300	27,960	17,674	40,000	22,326	.....
Johnson	250	200	.....	3,700	3,700	.....
Lafayette	263,927	258,177	325,798	301,066	.....	24,732
Linn	99,035	64,504	81,598	68,643	.....	12,955
Livingston	623	706	.....	4,500	4,500	.....
Macon	506,270	459,778	573,556	742,413	168,857	.....
Moniteau	425	250	.....	.....	.....	.....
Montgomery	10,881	12,106	19,865	1,200	.....	18,665
Morgan	1,720	200	6,000	.....	.....	6,000
Pettis .....	.....	.....	800	.....	.....	800
Putnam	69,044	87,740	102,922	117,059	14,137	.....
Ralls	9,800	10,628	8,700	7,980	.....	720
Randolph	228,097	255,713	311,099	253,558	.....	57,541
Ray	133,681	129,356	182,240	210,961	28,721	.....
Saline	150	400	.....	.....	.....	.....
St. Clair	220	80	.....	.....	.....	.....
Vernon	303,083	242,616	279,031	181,337	.....	97,694
Other coun- ties and small mines.	120,000	120,000	120,000	120,000	.....	.....
Total	2,372,393	2,331,542	2,665,626	2,688,321	a 22,695	.....

a Net increase.

The annual production since 1873 has been as follows:

Coal product of Missouri since 1873.

Year.	Short tons.	Year.	Short tons.
1873.....	784,000	1886.....	1,800,000
1874.....	789,680	1887.....	3,209,916
1875.....	840,000	1888.....	3,909,967
1876.....	1,008,000	1889.....	2,557,823
1877.....	1,008,000	1890.....	2,735,221
1878.....	1,008,000	1891.....	2,674,606
1879.....	1,008,000	1892.....	2,773,949
1880.....	1,680,000	1893.....	2,897,442
1881.....	1,960,000	1894.....	2,245,039
1882.....	2,240,000	1895.....	2,372,393
1883.....	2,520,000	1896.....	2,331,542
1884.....	2,800,000	1897.....	2,665,626
1885.....	3,080,000	1898.....	2,688,321

MONTANA.

Total product in 1898, 1,479,803 short tons; spot value, \$2,324,207.

After rounding out a full decade of uninterrupted increase in its annual output of coal, Montana in 1898 is distinguished by being one of three States out of thirty whose product decreased as compared with 1897. No satisfactory explanation is offered to account for this decrease, the bulk of which was borne by Cascade County. The loss in this county amounted to about 150,000 tons, and the total decrease for the State was 168,079 tons. The product of Gallatin County also fell off to the amount of nearly 70,000 tons, the total loss in the two counties being in part made up by an increase of 27,000 tons in Carbon County and of about 24,000 tons in Park County. The changes in other counties were unimportant. Another unfavorable feature shown by the statistics for 1898 is a decrease of \$573,201 in the value of the product and a decline in the average price per ton from \$1.76 to \$1.57, a loss of 19 cents, or 11 per cent. The product by machines in 1898 was 38,732 tons less than in 1897.

Cascade County, notwithstanding the decrease in 1898, contributed about two-thirds to the product; Carbon County produced 18 per cent, and Park County 10 per cent—these three furnishing 95 per cent of the total. In the following tables is shown details of production, by counties, in 1897 and 1898, with the distribution of the product for consumption:

COAL.

441

Coal product of Montana in 1897, by counties.

County.	Num-ber of mines.	Loaded at mines for ship-ment.	Sold to local trade and used by em-ployees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Aver-age price per ton.	Aver-age num-ber of days active.	Aver-age number of em-ployees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Cascade ...	5	1,040,783	19,098	13,802	64,907	1,138,590	\$1,999,104	\$1.76	289	1,491
Choteau ...	4	2,495	2,350	.....	.....	4,845	12,340	2.55	198	30
Gallatin ...	2	130,913	1,250	250	.....	132,413	223,024	1.68	286	181
Park	6	21,189	1,700	.....	100,000	122,889	294,072	2.39	191	301
Carbon	5	239,478	5,309	4,858	.....	249,145	368,868	1.48	219	334
Dawson ...										
Meagher										
Total.	22	1,434,858	29,707	18,410	164,907	1,647,882	2,897,408	1.76	252	2,337

Coal product of Montana in 1898, by counties.

County.	Num-ber of mines.	Loaded at mines for ship-ment.	Sold to local trade and used by em-ployees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Aver-age price per ton.	Aver-age num-ber of days active.	Aver-age number of em-ployees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Carbon	2	264,176	3,920	4,300	.....	272,396	\$393,884	\$1.45	270	410
Cascade	8	920,122	14,227	13,994	40,478	988,821	1,523,932	1.54	209	1,481
Choteau	11	140	6,357	40	.....	6,537	15,587	2.38	104	25
Fergus	4	.....	950	.....	.....	950	2,337	2.46	143	12
Gallatin	2	60,926	2,400	300	.....	63,626	102,712	1.61	246	102
Park	6	16,400	1,370	752	128,632	147,154	284,970	1.94	185	323
Dawson	3	50	260	.....	.....	319	785	2.46	44	6
Lewis and Clarke										
Meagher										
Total	36	1,261,814	29,493	19,386	169,110	1,479,803	2,324,207	1.57	216	2,359

Distribution of the coal product of Montana from 1889 to 1898.

Year.	Num-ber of mines.	Loaded at mines for ship-ment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Aver-age price per ton.	Aver-age num-ber of days active.	Aver-age number of em-ployees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
1889.		314,373	12,917	5,436	30,576	363,301	\$630,773	\$2.42	.....	.....
1890.		466,016	23,427	4,034	24,000	517,477	1,252,492	2.42	.....	1,251
1891.		501,503	5,395	6,438	28,535	541,861	1,228,630	2.27	.....	1,119
1892.		521,521	4,866	1,849	36,412	564,648	1,330,847	2.36	258	1,158
1893.		789,516	37,063	17,960	57,770	892,309	1,772,116	1.99	243	1,401
1894.	26	861,171	12,900	17,324	36,000	927,395	1,887,390	2.04	192	1,782
1895.	22	1,494,862	19,168	20,463	59,700	1,594,193	2,850,906	1.89	223	2,184
1896.	21	1,314,873	27,476	17,676	183,420	1,543,445	2,279,672	1.47	234	2,335
1897.	22	1,434,858	29,707	18,410	164,907	1,647,882	2,897,408	1.76	252	2,337
1898.	36	1,261,814	29,493	19,386	169,110	1,479,803	2,324,207	1.57	216	2,359

The following table shows the product and value, by counties, since 1896:

Product and value of Montana coal since 1896, by counties.

County.	1896.		1897.	
	Product.	Value.	Product.	Value.
	<i>Short tons.</i>		<i>Short tons.</i>	
Carbon.....	235,328	\$424,205	245,761	\$360,818
Cascade.....	1,101,298	1,473,532	1,138,590	1,999,104
Choteau.....	5,051	18,915	4,845	12,340
Dawson.....			2,800	6,250
Gallatin.....	108,460	214,535	132,413	223,024
Lewis and Clarke.....	56	250		
Meagher.....	120	360	584	1,800
Park.....	93,132	147,875	122,889	294,072
Total.....	1,543,445	2,279,672	1,647,882	2,897,408

County.	1898.		Increase, 1898.		Decrease, 1898.	
	Product.	Value.	Product.	Value.	Product.	Value.
	<i>Short tons.</i>		<i>Short tons.</i>		<i>Short tons.</i>	
Carbon.....	272,396	\$393,884	26,635	\$33,066		
Cascade.....	988,821	1,523,932			149,769	\$475,172
Choteau.....	6,537	15,537	1,692	3,247		
Fergus.....	950	2,337	950	2,337		
Gallatin.....	63,626	102,712			68,787	120,312
Dawson, Meagher, and Lewis and Clarke.....	319	785			3,065	7,265
Park.....	147,154	284,970	24,265			9,102
Total ..	1,479,803	2,324,207			a 168,097	a 573,201

a Net decrease.

The following table shows the total output of coal in Montana since 1883 and the value of the product for the last nine years:

Coal product of Montana since 1883.

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1883.....	19,795	.....	1891.....	541,861	\$1,228,630
1884.....	80,376	.....	1892.....	564,648	1,330,847
1885.....	86,440	.....	1893.....	892,309	1,772,116
1886.....	49,846	.....	1894.....	927,395	1,887,390
1887.....	10,202	.....	1895.....	1,504,193	2,850,906
1888.....	41,467	.....	1896.....	1,543,445	2,279,672
1889.....	363,301	.....	1897.....	1,647,882	2,897,408
1890.....	517,477	\$1,252,492	1898.....	1,479,803	2,324,207

NEBRASKA.

The southwestern corner of Nebraska contains a portion of the western coal field, but the veins of coal being on the edge of the field are pinched to thin seams, varying from 6 to 22 inches. Some coal has been taken out for local consumption, but with the development of the fields of Iowa, Kansas, and Missouri, more favored both as to quality and conditions for economical mining, and with the operators of these mines seeking a market for their surplus product, such little work as has been done on Nebraska coal deposits has been practically abandoned. A small amount (3,560 short tons) was mined in Dixon County in 1896, all of which was consumed locally. The product in 1897 fell off to 495 tons, and no output was obtained in 1898.

NEVADA.

No product has been reported from this State since 1894, when a small amount (150 short tons) was mined in Esmeralda County.

NEW MEXICO.

Total product in 1898, 992,288 short tons; spot value, \$1,344,750.

New Mexico approached very close to Arkansas and Michigan in the proportion of its increased production in 1898 over 1897. The product in 1898 was 275,307 tons larger than that of the preceding year, equivalent to an increase of 38.4 per cent, as compared to 40 per cent increase in Arkansas and Michigan. Increased production occurred in all three of the principal producing counties. Bernalillo County increased its production by 113,000 tons, or more than one-third; Colfax County had an increased output of 105,752 short tons, or nearly two-thirds, and Santa Fe County augmented its production 37,560 tons, or about 18½ per

cent. Part of the product of Santa Fe County (23,958 tons) was anthracite from the Lucas mine of the Cerrillos Coal Railroad Company.

Machine mining was reported in New Mexico for the first time in 1898. Machines were installed in two mines, the total number of machines being 29. The tonnage won by them was 163,849. No strikes were reported in the Territory, and except for a slight decline in the average price per ton from \$1.38 to \$1.35, the industry may be said to have been in a flourishing condition throughout the year.

The statistics of production in 1897 and 1898 are presented in detail in the following tables:

Coal product of New Mexico in 1897, by counties.

County.	Number of mines.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Total product.	Total value.	Average price per ton.	Average number of days active.	Average number of employees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Bernalillo	6	329,470	1,188	1,830	332,488	\$469,218	\$1.41	220	808
Colfax	3	157,000	4,424	2,039	163,463	195,443	1.20	160	407
Santa Fe	3	192,923	892	14,840	208,655	311,355	1.49	228	420
Lincoln	3	10,030	1,340	1,005	12,375	15,000	1.26	265	24
Rio Arriba									
San Juan									
Total	15	669,423	7,844	19,714	716,981	991,611	1.38	208	1,659

Coal product of New Mexico in 1898, by counties.

County.	Number of mines.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Average price per ton.	Average number of days active.	Average number of employees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Bernalillo	8	441,123	1,580	2,855	.....	445,558	\$625,052	\$1.40	234	919
Colfax	3	243,173	4,577	4,341	17,124	269,215	320,443	1.19	259	408
Rio Arriba	5	265,607	1,503	10,405	.....	277,515	399,255	1.44	245	546
San Juan										
Santa Fe										
Total	16	949,903	7,660	17,601	17,124	992,288	1,344,750	1.35	242	1,873

Distribution of the coal product of New Mexico from 1889 to 1898.

Year.	Num- ber of mines.	Loaded at mines for ship- ment.	Sold to local trade and used by em- ployees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Aver- age price per ton.	Aver- age num- ber of days active.	Aver- age number of em- ployees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
1889.....		466,127	8,953	6,383	6,000	486,463	\$870,468	\$1.79		
1890.....		358,332	11,960	6,065		375,777	504,390	1.34	192	827
1891.....		448,612	8,471	6,245	4,000	462,328	779,018	1.68	265	806
1892.....		645,557	8,776	6,997		661,330	1,074,601	1.62	223	1,083
1893.....		636,002	5,618	8,776	14,698	665,094	979,044	1.47	229	1,011
1894.....	20	561,523	8,266	14,365	13,042	597,196	935,857	1.57	182	985
1895.....	22	695,634	13,045	11,202	683	720,654	1,072,520	1.49	190	1,383
1896.....	16	607,319	6,677	7,446	1,184	622,626	930,381	1.49	172	1,559
1897.....	15	689,423	7,844	19,714		716,981	991,611	1.38	208	1,659
1898.....	16	949,903	7,660	17,601	17,124	992,288	1,344,750	1.35	242	1,873

In the following table the product since 1895 is shown by counties, together with the increase and decrease in 1898, as compared with 1897:

Coal product of New Mexico since 1882, by counties.

[Short tons.]

County.	1895.	1896.	1897.	1898.	Increase, 1898.	Decrease, 1898.
Bernalillo.....	308,676	271,137	332,488	445,558	113,070	.....
Colefax.....	187,102	179,415	163,463	269,215	105,752	.....
Lincoln.....	3,125	2,535	75	.....	.....	75
Rio Arriba.....	32,000	8,200	a 12,300	31,000	18,700	.....
Santa Fe.....	a 189,751	a 161,339	208,655	246,215	37,560	.....
Other counties.....	.....	.....	.....	300	300	.....
Total...	720,654	622,626	716,981	992,288	b 275,307	.....

a Including San Juan County.

b Net increase.

The following table shows the annual output of the Territory since 1882, with the value of the product since 1885. It is probable, however, that the values given for years prior to 1889 are too high. They were estimated on a basis of \$3 per ton, which was evidently excessive.

Coal product of New Mexico since 1882.

Year.	Quantity.	Value.	Year.	Quantity.	Value.
	<i>Short tons.</i>			<i>Short tons.</i>	
1882.....	157,092		1891.....	462,328	\$779,018
1883.....	211,347		1892.....	661,330	1,074,251
1884.....	220,557		1893.....	665,094	979,044
1885.....	306,202	\$918,606	1894.....	597,196	935,857
1886.....	271,285	813,855	1895.....	720,654	1,072,520
1887.....	508,034	1,524,102	1896.....	622,626	930,381
1888.....	626,665	1,879,995	1897.....	716,981	991,611
1889.....	486,943	872,628	1898.....	992,288	1,344,750
1890.....	375,777	504,390			

NORTH CAROLINA.

Total product in 1898, 11,495 short tons; spot value, \$14,368.

The only product reported in 1898, as in 1897, was from the Cumnock mine in Chatham County. Production in 1898 was curtailed by a fire in the mine.

Coal product of North Carolina for eight years.

Year.	Number of mines.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Total product.	Total value.	Average price per ton.	Average number of days active.	Average number of employees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
1891.....	1	18,780	600	975	20,335	\$39,635	\$1.93	254	80
1892.....	1	6,679			6,679	9,599	1.44	160	90
1893.....	1	15,000		2,000	17,000	25,500	1.50	80	70
1894.....	1	13,500	1,000	2,400	16,900	29,675	1.76	145	95
1895.....	3	23,400	600	900	24,900	41,350	1.66	226	61
1896.....	1	5,356	295	2,162	7,813	11,720	1.50	220	18
1897.....	1	21,280			21,280	27,000	1.34	215	51
1898.....	1	9,852	304	1,339	11,495	14,368	1.25		

The history of coal mining in the State dates from 1889. The Egypt mines, now called the Cumnock, were opened in December of that year, and yielded 192 tons. Since that time the product annually has been as follows:

COAL.

447

Coal product of North Carolina since 1889.

Year.	Quantity.	Value.	Year.	Quantity.	Value.
	<i>Short tons.</i>			<i>Short tons.</i>	
1889.....	192	\$451	1894.....	16,900	\$29,675
1890.....	10,262	17,864	1895.....	24,900	41,350
1891.....	20,355	39,635	1896.....	7,813	11,720
1892.....	6,679	9,599	1897.....	21,280	27,000
1893.....	17,000	25,500	1898.....	11,495	14,368

NORTH DAKOTA.

Total product in 1898, 83,895 short tons; spot value, \$93,591.

A slight increase of 6,649 short tons in 1898 over the output of 1897 entitles North Dakota to consideration as one of the twenty-two States whose product of coal attained its maximum in 1898. The production in the last two years was as follows:

Coal product of North Dakota in 1897, by counties.

County.	Number of mines.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Total product.	Total value.	Average price per ton.	Average number of days active.	Average number of employees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Burleigh.....	4		2,750	115	2,865	\$2,488	\$0.87	101	15
Emmons.....	2		800	20	820	2,116	2.52	130	6
McLean.....	6	14,500	3,525	65	18,090	24,045	1.33	177	54
Ward.....									
Morton.....	5	28,532	683	56	29,271	29,410	1.00	154	69
Stark.....	3	22,000	2,700	1,500	26,200	25,744	.98	233	26
Total.....	20	65,032	10,458	1,756	77,246	83,803	1.08	168	170

Coal product of North Dakota in 1898, by counties.

County.	Number of mines.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Total product.	Total value.	Average price per ton.	Average number of days active.	Average number of employees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Burleigh.....	4	800	1,325	20	2,145	\$1,912	\$0.90	106	14
Emmons.....	2		500		500	1,368	2.44	118	4
Morton.....	3	12,420	500		12,920	12,756	.94	162	23
Stark.....	3	37,500	6,780	1,000	45,280	46,105	1.02	209	48
McLean.....	6	20,503	2,360	127	22,990	31,450	1.37	188	62
Ward.....									
Total.....	18	71,223	11,525	1,147	83,895	93,591	1.12	187	151

MINERAL RESOURCES.

Distribution of the coal product of North Dakota from 1889 to 1898.

Year.	Num- ber of mines.	Loaded at mines for ship- ment.	Sold to local trade and used by em- ployees.	Used at mines for steam and heat.	Total prod- uct.	Total value.	Aver- age price per ton.	Aver- age number of days active.	Average number of em- ployees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
1889.....		18,610	10,297		28,907	\$41,431	\$1.43		
1890.....			30,000		30,000	42,000	1.40		
1891.....			30,000		30,000	42,000	1.40		
1892.....		38,000	2,725		40,725	39,250	.96	216	54
1893.....		47,968	1,612	50	49,630	56,250	1.13	183	88
1894.....	8	37,311	4,480	224	42,015	47,049	1.12	156	77
1895.....	8	35,380	3,617		38,997	41,646	1.07	143	62
1896.....	10	71,447	6,183	420	78,050	84,908	1.09	166	141
1897.....	20	65,032	10,458	1,756	77,246	83,803	1.08	168	170
1898.....	18	71,223	11,525	2,147	83,895	93,591	1.12	187	151

Coal product of North Dakota since 1884.

Year.	Short tons.	Year.	Short tons.
1884.....	35,000	1892.....	40,725
1885.....	25,000	1893.....	49,630
1886.....	25,955	1894.....	42,015
1887.....	21,470	1895.....	38,997
1888.....	34,000	1896.....	78,050
1889.....	28,907	1897.....	77,246
1890.....	30,000	1898.....	83,895
1891.....	30,000		

OHIO.

Total product in 1898, 14,516,867 short tons; spot value, \$12,027,336.

An increase of 2,319,925 short tons in the production of 1898, as compared with 1897, marked a noteworthy recovery from the decreased production in 1896 and 1897 and made 1898 the record-holding year in coal tonnage for Ohio, a distinction shared with 21 other coal-producing States. This gratifying history is made still more satisfactory from the producers' standpoint by still larger proportionate increase in value, for while the tonnage increased 19 per cent the value of the product shows a gain of 26 per cent, and the average price per ton an advance of 5 cents, from 78 cents in 1897 to 83 cents in 1898. Not in a decade have the coal producers in Ohio experienced as satisfactory a year's business as that of 1898. For ten years prices have been steadily declining, and while the reaction in 1898 did not put the price up to what it was from 1889 to 1893, the advance made, combined with the increased tonnage and the economies in production effected by the

use of mechanical methods for mining and underground haulage, placed a welcome and unaccustomed margin between the cost and selling value.

The returns to the Survey for 1898 show that the number of mining machines in use in that year was 242, an increase of 18 from the 224 in use the year before. While this was an increase of only 8 per cent, the tonnage won by machines in 1898 was over 33½ per cent more than that of 1897. In the previous year 3,843,345 tons were mined with machines; in 1898 5,191,375 short tons, an increase of 1,348,030 tons being the record for machine-mined coal. But while this was a remarkable increase, it is hardly comparable with that of Pennsylvania, where the machine-mined product increased from 8,925,293 short tons to a little over 16,000,000 short tons, or nearly 100 per cent.

Strikes occurred at 41 of the 431 mines operating in Ohio during 1898. The total number of men made idle was 5,222, entailing a total loss in working time of 182,000 days, an average of 35 days per man. Jackson County was responsible for the greater part of this loss, owing to a strike which began April 1, lasting in most cases thirty days, in three cases thirty-three days, and in two cases sixty days. Twenty-two out of the 50 mines in the county were affected by the strike and 3,089 men lost an average of 33 days each, equivalent to a total loss in working time of 100,920 days.

PRODUCTION BY COUNTIES.

The most notable increase in the county production in 1898 was made by Guernsey County, whose output jumped from 910,554 short tons in 1897 to 1,326,480 tons in 1898, nearly 50 per cent. In making this great increase Guernsey County not only adds the sixth to the counties yielding 1,000,000 tons or over, but outranked Hocking County, which, with Athens, Perry, and Jackson counties, formed the four million-ton producing counties prior to 1898. Perry County continues in first place, having superseded Jackson County in 1896. Its output in 1898 was 1,831,975 short tons. Jackson County maintains second place, and notwithstanding the loss of time by the strike of April, 1898, increased its product over 200,000 tons to 1,770,265 tons. Athens County, with an increase of nearly 500,000 tons over 1897, and a total of 1,651,449 tons in 1898 took third position, while Hocking County, with a decrease of about 140,000 tons in product, drops from third to fifth place. Athens, Hocking, and Perry counties form what is known as the Hocking Valley region. The loss in Hocking County was more than made up by the increased output in Athens and Perry counties, and the total product for the region showed an increase of 592,462 short tons.

Belmont County has twice before in its history passed the million-ton mark (in 1888 and 1892) and exceeded that figure in 1898 by 36,000 tons. Tuscarawas County, with an increase of 283,000 tons in

1898 and a total product of 909,857 tons, took seventh place, followed closely by Columbiana, Stark, and Jefferson in the order named. No other county produced as much as 500,000 tons in 1898.

The details of production by counties in 1897 and 1898, together with the distribution of the product for consumption, are exhibited in the following tables:

Coal product of Ohio in 1897, by counties.

County.	Num- ber of mines.	Loaded at mines for ship- ment.	Sold to local trade and used by em- ployees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Aver- age price per ton.	Aver- age num- ber of days active.	Aver- age number of em- ployees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Athens	26	1,077,711	19,041	38,737	18,153	1,153,642	\$776,155	\$0.67	140	2,472
Belmont	30	784,566	87,742	5,112		827,420	586,812	.71	161	1,818
Carroll	7	135,048	11,683	700	500	147,931	111,385	.75	155	884
Columbiana ..	20	691,498	78,976	4,262		774,736	555,127	.72	206	1,413
Coshocton ..	9	322,331	20,458	800		343,589	256,791	.75	192	487
Guernsey	11	891,880	6,836	11,838		910,554	558,362	.61	180	1,401
Hocking	15	1,376,265	12,097	23,445		1,411,907	942,063	.67	133	2,461
Jackson	24	1,461,592	71,032	30,027		1,562,651	1,389,205	.89	187	4,308
Jefferson	21	625,843	122,077	2,731	1,197	751,848	582,148	.77	161	1,500
Lawrence	7	77,771	9,444	125		87,340	66,699	.76	173	297
Mahoning	9	29,281	7,303	703		37,287	28,181	.76	177	117
Medina	7	159,816	4,566	6,030		170,412	181,173	1.06	154	396
Meigs	11	72,543	108,631	8,023		184,197	159,058	.86	185	501
Morgan	2	21,965				21,965	16,909	.77	109	145
Muskingum ..	11	84,845	46,361	300		131,606	120,334	.91	145	394
Perry	49	1,525,191	39,208	30,800		1,595,199	1,132,510	.71	128	3,624
Portage	4	55,975	21,232	2,030		79,237	107,889	1.36	129	306
Stark	27	595,507	27,258	16,300		639,065	677,607	1.06	181	2,234
Summit	4	42,594	6,569	3,010		52,173	60,760	1.16	132	156
Trumbull	3	11,000	1,407	200		12,607	20,700	1.64	153	40
Tuscarawas ..	29	582,317	41,808	2,847		626,972	450,522	.72	140	1,478
Vinton	5	52,054	951	1,000		54,005	51,224	.95	173	175
Washington ..	3	1,120	1,010			2,130	2,068	.98	82	23
Wayne	2	58,478	300	3,000		61,778	63,624	1.03	149	159
Gallia	2		17,872			17,872	12,260	.69	214	44
Scioto										
Harrison	2	37,661	428	735		38,824	25,823	.67	191	78
Noble										
Small mines ..			500,000			500,000	600,000			
Total ..	350	10,725,047	1,250,290	192,755	19,850	12,196,942	9,535,409	.78	148	26,410

COAL.

451

Coal product of Ohio in 1898, by counties.

County.	Num- ber of mines.	Loaded at mines for ship- ment.	Sold to local trade and used by employ- ees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Aver- age price per ton.	Aver- age num- ber of days active.	Aver- age num- ber of em- ploy- ees.
		Short tons.	Short tons.	Short tons.	Short tons.	Short tons.				
Athens.....	31	1,558,258	28,512	51,420	13,250	1,651,440	\$1,246,878	\$.75	161	3,040
Belmont....	32	912,113	121,766	2,223	.....	1,036,102	752,542	.73	177	1,715
Carroll.....	8	222,711	7,160	915	.....	230,786	172,268	.75	181	412
Columbiana..	20	862,183	20,435	11,062	.....	893,680	673,000	.75	222	1,445
Coshocton...	19	351,119	15,813	360	.....	367,292	332,592	.91	229	630
Guernsey...	14	1,294,297	15,518	16,665	.....	1,326,480	851,664	.65	234	1,700
Harrison....	2	28,307	385	420	.....	29,112	17,487	.60	174	84
Hocking.....	17	1,244,587	12,321	12,878	.....	1,269,786	932,818	.78	142	2,258
Jackson.....	50	1,660,561	60,830	30,835	.....	1,751,226	1,593,553	.90	145	4,215
Jefferson....	22	668,222	126,485	4,749	1,084	800,540	641,079	.80	240	1,150
Lawrence....	7	57,341	7,458	50	.....	64,849	51,065	.79	119	223
Mahoning...	11	20,720	14,318	752	.....	22,230	32,140	.90	175	109
Medina.....	10	232,813	10,350	6,243	.....	249,406	267,943	1.07	196	770
Meigs.....	15	46,918	125,329	1,974	.....	174,216	134,881	.77	117	540
Morgan.....	2	26,730	.....	.....	.....	26,730	19,003	.71	101	90
Muskingum...	19	112,943	24,463	100	.....	137,506	109,847	.80	164	327
Perry.....	56	1,761,724	30,573	39,678	.....	1,831,975	1,494,885	.82	151	3,195
Portage.....	4	76,138	3,826	2,695	.....	82,659	123,073	1.49	174	293
Stark.....	34	814,700	45,826	27,632	.....	888,158	1,050,401	1.18	151	2,304
Summit.....	4	46,985	4,697	40	.....	51,722	60,827	1.18	187	199
Trumbull....	3	1,375	265	100	.....	1,640	2,869	1.75	40	29
Tuscarawas..	37	885,731	19,646	4,480	.....	909,857	692,205	.76	163	1,765
Vinton.....	5	72,000	8,224	1,050	.....	81,274	74,231	.91	187	241
Washington..	3	1,112	1,846	.....	.....	2,958	2,734	.92	151	17
Wayne.....	8	24,321	3,903	5,132	.....	33,356	54,333	1.25	164	125
Gallia.....	3	50,623	7,231	1,430	.....	59,284	43,688	.74	201	110
Noble.....										
Scioto.....										
Small mines..	.....	.....	500,000	.....	.....	500,000	600,000	.....	.....	.....
Total....	431	13,053,427	1,226,184	222,913	14,343	14,516,867	12,027,336	.83	169	26,986

Distribution of the coal product of Ohio from 1889 to 1898.

Year.	Num- ber of mines.	Loaded at mines for ship- ment.	Sold to local trade and used by em- ployees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Aver- age price per ton.	Aver- age num- ber of days active.	Aver- age num- ber of em- ploy- ees.
		Short tons.	Short tons.	Short tons.	Short tons.	Short tons.				
1889.....	.....	8,566,223	1,196,872	144,223	69,469	9,976,787	\$9,355,400	\$.94	.....	19,343
1890.....	.....	10,161,887	1,164,876	143,984	23,759	11,494,506	10,783,171	.94	201	20,576
1891.....	.....	11,393,206	1,281,568	140,420	53,486	12,868,680	12,106,115	.94	206	22,182
1892.....	.....	11,995,256	1,411,642	117,486	38,543	13,562,927	12,722,745	.94	212	22,576
1893.....	.....	11,713,116	1,348,743	107,002	24,785	13,253,646	12,351,139	.92	188	23,931
1894.....	374	10,638,402	1,101,940	126,397	45,117	11,911,956	9,841,723	.83	136	27,105
1895.....	415	11,933,686	1,227,224	152,277	42,619	13,355,806	10,618,477	.79	176	24,644
1896.....	408	11,494,275	1,181,610	172,722	26,595	12,875,202	10,253,461	.79	161	25,500
1897.....	350	10,725,047	1,259,290	192,755	19,850	12,196,942	9,535,409	.78	148	26,410
1898.....	431	13,053,427	1,226,184	222,913	14,343	14,516,867	12,027,336	.83	169	26,986

MINERAL RESOURCES.

Coal product of Ohio since 1895, by counties.

[Short tons.]

County.	1895.	1896.	1897.	1898.	Increase, 1898.	Decrease, 1898.
Athens	1,433,226	1,398,141	1,153,642	1,651,449	497,807	.....
Belmont ...	846,643	919,076	827,420	1,036,102	208,682	.....
Carroll.....	260,879	289,117	147,931	230,786	82,855	.....
Columbiana	617,654	534,697	774,736	893,680	118,944	.....
Coshocton..	207,620	359,379	343,589	367,292	23,703	.....
Gallia.....	12,900	2,080	13,802	11,488	.....	2,314
Guernsey...	886,581	955,457	910,554	1,326,480	415,926	.....
Harrison ...	3,472	2,504	5,886	29,112	23,226	.....
Hocking ...	1,587,985	1,415,468	1,411,907	1,269,786	.....	142,121
Jackson....	2,005,384	1,629,226	1,562,651	1,770,265	207,614	.....
Jefferson ...	885,322	687,912	751,848	800,540	48,692	.....
Lawrence ..	88,502	51,597	87,340	64,849	.....	22,491
Mahoning ..	42,482	24,693	37,287	35,785	.....	1,502
Medina	264,171	194,104	170,412	249,406	78,994	.....
Meigs	184,076	259,386	184,197	174,216	.....	9,981
Morgan	16,000	16,294	21,965	26,730	4,765	.....
Muskingum	103,860	112,333	131,606	137,506	5,900	.....
Perry	1,711,944	1,722,572	1,595,199	1,831,975	236,776	.....
Portage.....	86,576	48,377	79,237	82,659	3,422	.....
Stark	779,733	962,618	639,065	888,158	249,093	.....
Summit	25,606	23,470	52,173	51,722	.....	451
Trumbull ..	15,801	2,280	12,607	1,640	.....	10,967
Tuscarawas	657,094	641,087	626,972	909,857	282,885	.....
Vinton	18,005	39,439	54,005	81,274	27,269	.....
Washington	3,489	3,320	2,130	2,958	828	.....
Wayne	110,801	55,438	61,773	43,356	.....	18,417
Noble	}	25,137	37,008	47,796	10,788	.....
Scioto.....						
Small mines	500,000	500,000	500,000	500,000	.....	.....
Total...	13,355,806	12,875,202	12,196,942	14,516,867	2,319,925	.....

a Net increase.

Records of the total production of coal in Ohio extend only as far back as 1872, since which time the annual output has been as follows:

Annual coal product of Ohio since 1872.

Year.	Short tons.	Year.	Short tons.
1872.....	5,315,294	1886.....	8,435,211
1873.....	4,550,028	1887.....	10,300,708
1874.....	3,267,585	1888.....	10,910,951
1875.....	4,864,259	1889.....	9,976,787
1876.....	3,500,000	1890.....	11,494,506
1877.....	5,250,000	1891.....	12,868,683
1878.....	5,500,000	1892.....	13,562,927
1879.....	6,000,000	1893.....	13,253,646
1880.....	7,000,000	1894.....	11,909,856
1881.....	8,225,000	1895.....	13,355,806
1882.....	9,450,000	1896.....	12,875,202
1883.....	8,229,429	1897.....	12,196,942
1884.....	7,640,062	1898.....	14,516,867
1885.....	7,816,179		

OREGON.

Total product in 1898, 58,184, short tons; spot value, \$212,184.

Oregon's coal product in 1898 was only about 55 per cent of what it was in 1897, the decrease being due to the closing down of the Beaver Hill mine, which was opened in 1895 and contributed to the increased output of the State in 1896 and 1897. The removal of this factor and the consequent decreased output were reflected in a decided increase in the average price per ton, which showed an advance from \$2.72 in 1897 to \$3.65 in 1898.

The following tables show the statistics of production for the past seven years and the total output since 1885:

Coal product in Oregon since 1892.

Year.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Total product.	Total value.	Average number of employees.	Average number of days worked.
	Short tons.	Short tons.	Short tons.	Short tons.			
1892.....	31,780	2,353	548	34,681	\$148,546	90	120
1893.....	37,835	3,594	254	41,683	164,500	110	192
1894.....	45,068	2,171	282	47,521	183,914	83	243
1895.....	58,108	5,294	283	73,685	247,901	414	a 69
1896.....	88,116	12,951	654	101,721	294,564	254	191
1897.....	92,921	5,207	9,161	107,289	291,772	375	200
1898.....	54,305	3,290	589	58,184	212,184	142	199

a The apparently large number of men employed and small average working time are due to the large force of men employed in developing the Beaver Hill mine, which was producing coal for shipment during only twenty days in 1895. The average time made at the Newport mines was over two hundred days per man.

Coal product of Oregon from 1885 to 1898.

Year.	Short tons.	Year.	Short tons.
1885.....	50,000	1892.....	34,661
1886.....	45,000	1893.....	41,683
1887.....	37,696	1894.....	47,521
1888.....	75,000	1895.....	73,685
1889.....	64,359	1896.....	101,721
1890.....	61,514	1897.....	107,289
1891.....	51,826	1898.....	58,184

PENNSYLVANIA.

Total product in 1898, 105,846,229 long tons, or 118,547,777 short tons; spot value, \$118,767,125. Anthracite: Total product, 47,663,075 long tons, or 53,382,644 short tons; spot value, \$75,414,537. Bituminous: Total product, 58,183,154 long tons, or 65,165,133 short tons; spot value, \$43,352,588.

Compared with 1897, the total product of anthracite and bituminous coal in 1898 showed an increase of 10,284,038 long tons, or 11,518,123 short tons, all but about 700,000 tons of which was in the output of bituminous coal. The increase in the product of Pennsylvania was larger than the entire product of any other State, except Illinois, West Virginia, and Ohio. It was also equal to 58 per cent of the total increase in the coal product of the United States. The combined product of anthracite and bituminous coal in 1898 furnished 54 per cent of the total coal output of the country, against 53 per cent in 1897. The value of the anthracite product in 1898 was \$3,887,417 less than that of the slightly smaller output in 1897. There was also a decline of 2 cents per ton in the average price of Pennsylvania bituminous coal, but owing to the largely increased output the total value exhibited an increase of \$5,889,069. Mining of bituminous coal in Pennsylvania by the use of machines increased about 100 per cent in 1898 over 1897, and this offers a satisfactory explanation for the decline in price. The details of production by machinery are discussed in subsequent pages, where the statistics of bituminous coal production are more fully considered.

Anthracite coal operators did not share in the general prosperity of 1898 if the statistics of production are to be considered indicative. The product for the year was about 700,000 long tons over that of 1897, but nearly 70 per cent of this increase was in colliery consumption, so that the marketable product was only a little more than 230,000 long tons. Moreover, there was an actual decrease in the value of the coal sold amounting to \$3,887,417.

The comparatively stationary condition of the anthracite trade in a year of unprecedented activity, not only in bituminous coal mining but in the iron, steel, and other metallurgical industries, and manufacturing enterprises generally, calls renewed attention to the increased use of bituminous coal and its products of coke and gas for domestic purposes in direct competition with anthracite coal. For a number of years anthracite producers have been endeavoring to solve the problem of how to keep the production of coal within the market requirements. Agreements to restrict production by operating one-half, two-thirds, or three-fourths time, as the case may be, have been made, and while not at all times strictly adhered to, have had a beneficial effect so far as preventing a large surplus output was concerned. It is readily seen, however, that as the expense of up-keep and administration, as well as fixed charges for interest, etc., are practically the same whether the collieries are run half or full time, any unnatural or forced restriction in the product increases the cost of every ton of coal produced. This necessitates a higher selling price, and then the "endless chain" is completed by the increased use of bituminous coal, coke, or gas with every advance made on the price of anthracite. The increasing substitution of mechanical methods for hand labor in bituminous coal mining has materially reduced the cost of production, while, as shown above, the cost of mining anthracite has an increasing tendency. It is true that there are certain markets for anthracite that will be held by it as long as the supply lasts, but consumers who are obliged to practice economy in the mill or household will weigh carefully the advantages or disadvantages of each kind of fuel and give the preference to the cheapest.

One of the developments of recent years, which has curtailed the market for anthracite coal, and which is not usually thought of, is the construction of the large office and apartment buildings, which use steam heat generated from bituminous coal or a mixture of bituminous and small anthracite, and gas for cooking purposes. They thus take the place of many small individual consumers of the more profitable sizes of anthracite. When it is considered that one of these modern structures shelters enough people to make a good-sized town, it can be readily conceived that they have had no inconsiderable effect upon the anthracite trade.

Pennsylvania, as is well known, is by far the most important of the coal-producing States. It so completely outranks every other producing State, having in the combined product of anthracite and bituminous coal in 1898 more than six times the output of Illinois, which stands second, that comparisons are only of interest when drawn with reference to the ratio of Pennsylvania's output to that of the total in the United States or of the combined product of the other States. It is not possible to carry such comparisons back to an earlier date than 1880, owing to incomplete statistics in a number of the States. Dur-

ing 1880 the total output of coal in the United States was 63,822,830 long tons, or 71,481,569 short tons, of which Pennsylvania produced 42,437,242 long tons, or 47,529,711 short tons, or practically two-thirds of the total.

The product of Pennsylvania coal has always exceeded 50 per cent of the total product of the United States, the lowest percentage being 52, in 1884 and 1888. The average percentage for the nineteen years from 1880 to 1898, inclusive, was 55. In the following table is shown the total product of Pennsylvania and the United States since 1880, with the percentage of the total produced by Pennsylvania in each year:

Product of Pennsylvania coal compared with total United States since 1880.

Year.	Total United States.	Pennsylvania.	Per cent of Pennsylvania to total.
	<i>Short tons.</i>	<i>Short tons.</i>	
1880.....	71,481,569	47,529,711	65
1881.....	85,881,030	54,320,018	63
1882.....	103,285,789	57,254,507	55
1883.....	115,212,125	62,488,190	54
1884.....	119,735,051	62,404,488	52
1885.....	110,957,522	62,137,271	56
1886.....	112,743,403	62,857,210	56
1887.....	129,975,557	70,372,857	54
1888.....	148,659,402	77,719,624	52
1889.....	141,229,514	81,719,059	58
1890.....	157,788,657	88,770,814	56
1891.....	168,566,668	93,453,921	55
1892.....	179,329,071	99,167,080	55
1893.....	182,352,774	98,038,267	54
1894.....	170,741,526	91,833,584	54
1895.....	193,117,530	108,216,565	56
1896.....	191,966,357	103,903,534	54
1897.....	200,221,665	107,029,654	53
1898.....	219,974,667	118,547,777	54
Total	2,803,239,877	1,547,764,131	55

PENNSYLVANIA ANTHRACITE.¹

A glance at the figures showing the production and average price of anthracite for 1898 would seem to indicate a more unsatisfactory condition of the trade than was noted for 1897; for, while there was an increase in the total product of 688,361 tons, the actual increase in amount shipped to market was only 247,758 tons. In addition to this, the value at the mines decreased 10 cents per ton as compared with 1897, making the total value at the mines \$3,887,417 less than the value of the smaller product of 1897.

The year 1898 was unquestionably not a good one for this industry, and were it not for conditions not shown by the figures, but which must be considered with them in order to get a comprehensive idea of the trade, the prospect for the anthracite business would be far from encouraging. These conditions will be spoken of at some length further on in the report, and in order to understand them we will first consider the figures themselves as compared with those of previous years.

The total product of anthracite coal in 1898 amounted to 47,663,076 tons; of this there were shipped to market 42,043,376 tons; 1,105,417 tons were sold to local trade in the vicinity of the mines, and 4,514,283 tons used for steam and heat at the mines themselves. This last item is not made up of the ordinary marketable domestic sizes, but consists largely of refuse coal, and for this reason has never been taken into account in computing the value of coal at the mines. Accordingly, in the table which follows the total value of coal at the mines as given relates to the total product less this last-named amount.

Production of anthracite coal in 1897 and 1898.

Year.	Total product.	Value at mines.	Average price per ton.	Number persons employed.	Number days worked.
	<i>Long tons.</i>				
1897.....	46,974,715	\$79,301,954	\$1.85	149,537	150
1898.....	47,663,076	75,414,537	1.75	145,184	152

¹ By William W. Ruley, chief of bureau of anthracite coal statistics.

As will be noted in another part of this report, describing the area and location of the anthracite fields, they lie in nine counties, including the Bernice field in Sullivan County, the names of which, together with the product of each for the last two years, are given in the following tables:

Anthracite coal product in 1897, by counties.

County.	Total product.	Shipments.	Local trade.	Used at mines.
	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>
Susquehanna.....	430,515	393,002	7,513	30,000
Lackawanna.....	11,925,360	10,894,558	274,921	755,881
Luzerne.....	17,024,539	15,218,196	424,757	1,381,586
Carbon.....	1,467,965	1,263,245	31,182	173,538
Schuylkill.....	11,357,343	9,910,043	225,119	1,222,181
Columbia and Sullivan.	467,029	422,752	7,953	36,324
Northumberland.....	3,639,122	3,195,160	104,646	339,316
Dauphin.....	662,842	498,662	60,000	104,180
Total.....	46,974,715	41,795,618	1,136,091	4,043,006

Anthracite coal product in 1898, by counties.

County.	Total product.	Shipments.	Local trade.	Used at mines.
	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>	<i>Long tons.</i>
Susquehanna.....	400,857	375,121	7,736	18,000
Lackawanna.....	12,130,122	11,023,620	317,382	789,120
Luzerne.....	17,699,936	15,658,233	399,579	1,642,124
Carbon.....	1,465,877	1,224,449	41,662	199,766
Schuylkill.....	11,215,997	9,674,555	224,025	1,317,417
Columbia and Sullivan.	582,222	529,330	9,703	43,189
Northumberland.....	3,490,604	3,027,550	87,399	375,655
Dauphin.....	677,461	530,518	17,931	129,012
Total.....	47,663,076	42,043,376	1,105,417	4,514,283

Below is given table showing shipments from the three trade regions from the beginning of the industry to the end of 1898:

Annual shipments from the Schuylkill, Lehigh, and Wyoming regions from 1820 to 1898.

Year.	Schuylkill region.		Lehigh region.		Wyoming region.		Total.
	Long tons.	Percent.	Long tons.	Percent.	Long tons.	Percent.	Long tons.
1820...			365				365
1821...			1,073				1,073
1822...	1,480	39.79	2,240	60.21			3,720
1823...	1,128	16.23	5,823	83.77			6,951
1824...	1,567	14.10	9,541	85.90			11,108
1825...	6,500	18.60	28,393	81.40			34,893
1826...	16,767	34.90	31,280	65.10			48,047
1827...	31,360	49.44	32,074	50.56			63,434
1828...	47,284	61.00	30,232	39.00			77,516
1829...	79,973	71.35	25,110	22.40	7,000	6.25	112,083
1830...	89,984	51.50	41,750	23.90	43,000	24.60	174,734
1831...	81,854	46.29	40,966	23.17	54,000	30.54	176,820
1832...	209,271	57.61	70,000	19.27	84,000	23.12	363,271
1833...	252,971	51.87	123,001	25.22	111,777	22.91	487,749
1834...	226,692	60.19	106,244	28.21	43,700	11.60	376,636
1835...	339,508	60.54	131,250	23.41	90,000	16.05	560,758
1836...	432,045	63.16	148,211	21.66	103,861	15.18	684,117
1837...	530,152	60.98	223,902	25.75	115,387	13.27	869,441
1838...	446,875	60.49	213,615	28.92	78,207	10.59	738,697
1839...	475,077	58.05	221,025	27.01	122,300	14.94	818,402
1840...	490,596	56.75	225,313	26.07	148,470	17.18	864,379
1841...	624,466	65.07	143,037	14.90	192,270	20.03	959,773
1842...	583,273	52.62	272,540	24.59	252,599	22.79	1,108,412
1843...	710,200	56.21	267,793	21.19	285,605	22.60	1,263,598
1844...	887,937	54.45	377,002	23.12	365,911	22.43	1,630,850
1845...	1,131,724	56.22	429,453	21.33	451,836	22.45	2,013,013
1846...	1,308,500	55.82	517,116	22.07	518,389	22.11	2,344,005
1847...	1,665,735	57.79	633,507	21.98	583,067	20.23	2,882,309
1848...	1,733,721	56.12	670,321	21.70	685,196	22.18	3,089,238
1849...	1,728,500	53.30	781,556	24.10	732,910	22.60	3,242,966
1850...	1,840,620	54.80	680,456	20.56	827,823	24.64	3,358,899
1851...	2,328,525	52.34	964,224	21.68	1,156,167	25.98	4,448,916
1852...	2,636,835	52.81	1,072,136	21.47	1,284,500	25.72	4,993,471
1853...	2,665,110	51.30	1,054,309	20.29	1,475,732	28.41	5,195,151
1854...	3,191,670	53.14	1,207,186	20.13	1,603,478	26.73	6,002,334
1855...	3,552,943	53.77	1,284,113	19.43	1,771,511	26.80	6,608,567
1856...	3,603,029	52.91	1,351,970	19.52	1,972,581	28.47	6,927,580
1857...	3,373,797	50.77	1,318,541	19.84	1,952,603	29.39	6,644,941
1858...	3,273,245	47.86	1,380,030	20.18	2,186,094	31.96	6,839,369
1859...	3,448,708	44.16	1,628,311	20.86	2,731,236	34.98	7,808,255
1860...	3,749,632	44.04	1,821,674	21.40	2,941,817	34.56	8,513,123

Annual shipments from the Schuylkill, Lehigh, and Wyoming regions, etc.—Continued.

Year.	Schuylkill region.		Lehigh region.		Wyoming region.		Total.
	Long tons.	Percent.	Long tons.	Percent.	Long tons.	Percent.	Long tons.
1861...	3,160,747	39.74	1,738,377	21.85	3,055,140	38.41	7,954,264
1862...	3,372,583	42.86	1,351,054	17.17	3,145,770	39.97	7,869,407
1863...	3,911,683	40.90	1,894,713	19.80	3,759,610	39.30	9,566,006
1864...	4,161,970	40.89	2,054,669	20.19	3,960,836	38.92	10,177,475
1865...	4,356,959	45.14	2,040,913	21.14	3,254,519	33.72	9,652,391
1866...	5,787,902	45.56	2,179,364	17.15	4,736,616	37.29	12,703,882
1867...	5,161,671	39.74	2,502,054	19.27	5,325,000	40.99	12,988,725
1868...	5,330,737	38.52	2,502,582	18.13	5,968,146	43.25	13,801,465
1869...	5,775,138	41.66	1,949,673	14.06	6,141,369	44.28	13,866,180
1870...	4,968,157	30.70	3,239,374	20.02	7,974,660	49.28	16,182,191
1871...	6,552,772	41.74	2,235,707	14.24	6,911,242	44.02	15,699,721
1872...	6,694,890	34.03	3,873,339	19.70	9,101,549	46.27	19,669,778
1873...	7,212,601	33.97	3,705,596	17.46	10,309,755	48.57	21,227,952
1874...	6,866,877	34.09	3,773,836	18.73	9,504,408	47.18	20,145,121
1875...	6,281,712	31.87	2,834,605	14.38	10,596,155	53.75	19,712,472
1876...	6,221,934	33.63	3,854,919	20.84	8,424,158	45.53	18,501,011
1877...	8,195,042	39.35	4,332,760	20.80	8,900,377	39.85	20,828,179
1878...	6,282,226	35.68	3,237,449	18.40	8,085,587	45.92	17,605,262
1879...	8,960,829	34.28	4,595,567	17.58	12,586,293	48.14	26,142,689
1880...	7,554,742	32.23	4,463,221	19.05	11,419,279	48.72	23,437,242
1881...	9,253,958	32.46	5,294,676	18.58	13,951,383	48.96	28,500,017
1882...	9,459,288	32.48	5,689,437	19.54	13,971,371	47.98	29,120,096
1883...	10,074,726	31.69	6,113,809	19.23	15,604,492	49.08	31,793,027
1884...	9,478,314	30.85	5,562,226	18.11	a15,677,753	51.04	30,718,293
1885...	9,488,426	30.01	5,898,634	18.65	a16,236,470	51.34	31,623,530
1886...	9,381,407	29.19	5,723,129	17.89	a17,031,826	52.82	32,136,362
1887...	10,609,028	30.63	4,347,061	12.55	a19,684,929	56.82	34,641,018
1888...	10,654,116	27.93	5,639,236	14.78	a21,852,366	57.29	38,145,718
1889...	10,486,185	29.28	6,294,073	17.57	a19,036,835	53.15	35,817,093
1890...	10,867,822	29.68	6,329,658	17.28	a19,417,979	53.04	36,615,459
1891...	12,741,258	31.50	6,381,838	15.78	21,325,240	52.72	40,448,336
1892...	12,626,784	30.14	6,451,076	15.40	22,815,480	54.46	41,893,340
1893...	12,357,444	28.68	6,892,352	15.99	23,839,741	55.33	43,089,537
1894...	12,035,005	29.08	6,705,434	16.20	22,650,761	4.72	41,391,200
1895...	14,269,932	30.68	7,298,124	15.69	24,943,421	53.63	46,511,477
1896...	13,097,571	30.34	6,490,441	15.03	23,589,473	54.63	43,177,485
1897...	12,181,061	29.26	6,249,540	15.00	23,207,263	55.74	41,637,864
1898...	12,078,875	28.83	6,253,109	14.92	23,567,767	56.25	41,899,751
Total	365,751,626	33.89	187,550,308	17.37	525,938,026	48.74	1,079,239,960

a Includes Loyalsock field.

In the report for 1897 reference was made to the effect upon the consumption and price of anthracite produced by the competition of bituminous coal and the use of gas for domestic cooking and heating purposes, and the contention was made that while undoubtedly these factors to a certain extent limited the consumption of anthracite, yet at the same time the field was sufficiently large to maintain the present rate of consumption, and that a reasonable increase could be looked for when trade conditions generally improved.

It will be interesting to observe how far this contention is borne out by the facts. As noted on the first page of this report, the marketed tonnage for 1898 increased 261,887 tons as compared with 1897. This in itself is a comparatively small increase, but to it must be added the using up of a large amount of coal held in stock at various points, leaving the market at the close of the year with less coal on hand than has been the case for a number of years, so that in reality not only was the entire production of the year actually consumed, but in addition a considerable amount carried over from the previous year.

This condition of affairs allowed a favorable start for the year 1899, and, unless indications fail, the anthracite market will absorb a greater tonnage in 1899 than in 1898.

In regard to the lower average price of anthracite, it can only be said this was the natural result of cutting rates at various points, particularly in the West; but this had about subsided at the close of the year, prices being firmer on account of the rather heavy demand for coal brought about by the early cold weather.

As in every other industry, there will occur times when prices are demoralized, and certainly the coal trade has not lacked these instances; but this does not mean continued demoralization, and, indeed, from what has been said in regard to the condition of the trade at the close of 1898, there is reason to believe that prices will be better in 1899, and add to this the likelihood of a considerably enlarged tonnage, the prospects for the trade are encouraging.

To give the reader an idea of the anthracite territory, a tabular arrangement of the fields and a short description is given below, together with the names of the railroads reaching the territory:

<i>Geological field or basin.</i>	<i>Local district.</i>	<i>Trade region.</i>
Northern.....	Carbondale	Wyoming.
	Scranton	
	Pittston	
	Wilkesbarre.....	
	Plymouth	
Eastern middle.....	Kingston.....	Lehigh.
	Green Mountain.....	
	Black Creek.....	
	Hazleton	
Southern.....	Beaver Meadow	Schuylkill.
	Panther Creek	
	East Schuylkill	
	West Schuylkill.....	
	Lorberry.....	
Western middle	Lykens Valley	
	East Mahanoy.....	
	West Mahanoy	
	Shamokin	

The above territory is reached by eleven so-called initial railroads, as follows:

Philadelphia and Reading Railway Company.
Lehigh Valley Railroad Company.
Central Railroad Company of New Jersey.
Delaware, Lackawanna and Western Railroad Company
Delaware and Hudson Canal Company's Railroad.
Pennsylvania Railroad Company.
Erie and Wyoming Valley Railroad Company.
Erie Railroad Company.
New York, Ontario and Western Railway Company.
Delaware, Susquehanna and Schuylkill Railroad Company.
New York, Susquehanna and Western Railroad Company.

The above-named fields comprise an area of something over 480 square miles and are located in the eastern middle part of the State, in the counties of Carbon, Columbia, Dauphin, Lackawanna, Luzerne, Northumberland, Schuylkill, and Susquehanna, and are classed under three general divisions, viz, Wyoming, Lehigh, and Schuylkill regions. Geologically they are divided into fields or basins, which are again subdivided into districts.

The Bernice field in Sullivan County is not included in any of these regions. The classification of the product of this field is a matter of some contention. The fracture of the coal and some of its physical characteristics are more like some bituminous or semianthracite coals than strict anthracite, but on account of its high percentage of fixed carbon and low percentage of moisture it is classed as anthracite by the Second Pennsylvania Geological Survey, and the product is so included in this report.

The railroads noted after the table of regions are known as initial anthracite roads, and on them and their branches originates all the coal from the several regions.

In the following pages is given a directory of the anthracite mines in Pennsylvania, with names of operators, post-office addresses, etc.

Directory of anthracite coal mines in Pennsylvania.
NORTHERN COAL FIELD.

Map No.	Name of mine.	Location.					Operator.		
		Local district.	Inspectors' district.	Township, etc.	County.	Railroad.	Nearest shipping station.	Name.	Post-office address.
15	Erie	Carbondale	1	Carbondale Twp.	Lackawanna.	D. and H. C. Co. R. R.	Glenwood	Hillside Coal and Iron Co.	Scranton.
16	Glenwood	do	1	do	do	do	do	do	Do.
17	Keystone	do	1	do	do	do	Archbald	do	Do.
21	Raymond	do	1	Blakely Twp.	do	N. Y., O. and W. Rwy.	do	Raymond Coal Co.	Do.
23	Pierce	do	1	do	do	D., L. and W. R. R.	Winton	Pierce Coal Co., Limited	Winton.
18	Edgerton	do	1	do	do	Erie R. R.	Jermyn	Edgerton Coal Co., Limited	Scranton.
25	Sterrick Creek	do	1	do	do	do	Winton	Sterrick Creek Coal Co.	Do.
36	Johnson No. 1	do	1	do	do	N. Y., S. and W. R. R.	Dickson	Johnson Coal Co.	Do.
35	Johnson No. 2	do	1	do	do	do	do	do	Do.
28	Marshwood	do	1	do	do	Erie R. R.	Peckville	Moosie Mountain Coal Co.	Marshwood.
43	Murray	do	1	Dunmore Twp.	do	D., L. and W. R. R.	Scranton	Murray, Carney & Brown	Dunmore.
5	Northwest	do	1	Fell Twp.	do	Erie R. R.	Carbondale	Northwest Coal Co.	Scranton.
24	Mount Jessup	do	1	Blakely Twp.	do	D., L. and W. R. R. and N. Y., O. and W. Rwy.	Winton	Mount Jessup Coal Co., Limited.	Winton.
33	Olyphant	do	1	do	do	D. and H. C. Co. R. R.	Olyphant	D. and H. Canal Co.	Providence.
34	Eddy Creek	do	1	do	do	do	do	do	Do.
29	Grassy Island	do	1	do	do	do	do	do	Do.
20	White Oak	do	1	do	do	do	Archbald	do	Do.
19	Jermyn Shaft	do	1	Carbondale Twp.	do	do	Jermyn	do	Do.
11	Coal Brook	do	1	do	do	do	Carbondale	do	Do.
12	No. 1 Shaft	do	1	do	do	do	do	do	Do.
13	No. 3 Shaft	do	1	do	do	do	do	do	Do.

Directory of anthracite coal mines in Pennsylvania—Continued.
NORTHERN COAL FIELD—Continued.

Map No.	Name of mine.	Location.					Operator.		
		Local district.	Inspectors' district.	Township, etc.	County.	Railroad.	Nearest shipping station.	Name.	Post-office address.
	New Elk Creek	Carbondale	1	Fell Twp	Lackawanna.	Erie R. R.	Carbondale	Franklin Coal Co.	Carbondale.
	Nay Aug	do	2	Dunmore Twp	do	L. V. R. R.	Dunmore	Nay Aug Coal Co.	Scranton.
10	Racket Brook	do	1	Carbondale Twp	do	D. and H. C. Co. R. R.	Carbondale	D. and H. Canal Co.	Providence.
14	Powderly	do	1	do	do	do	do	do	Do.
3	Clinton	do	1	Fell Twp	do	do	Forest City	do	Do.
26	Dolph	do	1	Blakely Twp	do	L. V. R. R.	Jessup	Dolph Coal Co., Limited	Scranton.
32	Lackawanna	do	1	do	do	N. Y., O. and W. Rwy.	Olyphant	Lackawanna Coal Co., Lim.	Do.
31	Ontario	do	1	do	do	do	Peckville	N. Y. and Scranton Coal Co.	Peckville.
2	Forest City	do	1	Forest City	Susquehanna	Erie R. R.	Forest City	Hillside Coal and Iron Co.	Scranton.
1	Clifford	do	1	do	do	do	do	do	Do.
	West Ridge	do	2	do	Lackawanna	N. Y., O. and W. Rwy.	West Ridge	West Ridge Coal Co.	Do.
	Riverside	do	1	Archbald	do	do	Winton	Riverside Coal Co.	Do.
69	Archbald	Scranton	2	Lackawanna Twp	do	D., L. and W. R. R.	Scranton	D., L. and W. R. R. Co.	Do.
63	Bellevue	do	2	do	do	do	Bellevue	do	Do.
60	Briabin	do	2	3d Ward, Scranton	do	do	Scranton	do	Do.
59	Cayuga	do	2	do	do	do	do	do	Do.
68	Continental	do	2	Lackawanna Twp	do	do	do	do	Do.
64	Dodge	do	2	do	do	do	Bellevue	do	Do.
67	Hampton	do	2	do	do	do	Scranton	do	Do.
71	Holden	do	2	do	do	do	Taylorville	do	Do.
65	Hyde Park	do	2	5th Ward, Scranton	do	do	Scranton	do	Do.
	Oxford	do	2	do	do	do	do	do	Do.

Directory of anthracite coal mines in Pennsylvania—Continued.
NORTHERN COAL FIELD—Continued.

Map No.	Name of mine.	Location.					Operator.		
		Local district.	Inspectors district.	Township, etc.	County.	Railroad.	Nearest shipping station.	Name.	Post-office address.
73	Pyne	Scranton.....	2	Lackawanna Twp.	Lackawanna.	D., L. and W. R. R.	Taylorville.....	D., L. and W. R. R. Co.	Scranton.
	Columbus	do	2	Scranton.....	do	N. Y., O. and W. Rwy.	Scranton.....	Columbus Colliery Co	Do.
70	Sloan	do	2	Lackawanna Twp.	do	D., L. and W. R. R.	do	D., L. and W. R. R. Co.	Do.
44	Storrs	do	2	Blakely Twp.	do	do	Priceville.....	do	Do.
72	Taylor	do	2	Lackawanna Twp.	do	do	Taylorville.....	do	Do.
	Diamond No. 1.....	do	2	21st Ward, Scranton	do	do	Scranton.....	do	Do.
61	Diamond No. 2.....	do	2	do	do	do	do	do	Do.
	Tripp Shaft	do	2	do	do	do	do	do	Do.
38	Dunmore No. 1.....	do	1	Dunmore Twp.	do	E. and W. V. R. R.	Dunmore.....	Pennsylvania Coal Co	Dunmore.
41	Dunmore No. 5.....	do	2	do	do	do	do	do	Do.
	Bunker Hill	do	2	do	do	do	do	do	Do.
30	Blue Ridge	do	1	do	do	N. Y., O. and W. Rwy.	Peckville.....	Blue Ridge Coal Co.	Peckville.
	Austin	do	2	Old Forge Twp.	do	L. V. R. R.	Lackawanna.....	Austin Coal Co.	Scranton.
40	Gypsy Grove No. 3.....	do	1	Dunmore Twp.	do	E. and W. V. R. R.	Dunmore.....	Pennsylvania Coal Co	Dunmore.
	Gypsy Grove No. 4.....	do	1	do	do	do	do	do	Do.
52	Pine Brook	do	2	7th Ward, Scranton.	do	D., L. and W. R. R.	Scranton.....	Scranton Coal Co	Scranton.
53	Capouse	do	2	21st Ward, Scranton	do	do	do	do	Do.
76	Greenwood No. 1.....	do	2	Lackawanna Twp.	do	N. Y., S. and W. R. R.	Peckville.....	Greenwood Coal Co., Lim.	Do.
77	Greenwood No. 2.....	do	2	do	do	do	Minooka.....	do	Do.
80	Jermyn Nos. 1 and 2.....	do	2	Old Forge Twp.	do	L. V. R. R.	Taylorville.....	Jermyn & Co.	Do.
37	Pancoast	do	1	Blakely Twp.	do	D., L. and W. R. R.	Dickson City.....	Pancoast Coal Co	Do.
56	Bulls Head	do	2	2d Ward, Scranton.	do	do	Green Ridge.....	Bulls Head Coal Co.	Do.
79	Sibley	do	2	Old Forge Twp.	do	L. V. R. R.	Lackawanna.....	Elliott, McClure & Co.	Do.

Directory of anthracite coal mines in Pennsylvania—Continued.
NORTHERN COAL FIELD—Continued.

Map No.	Name of mine.	Location.					Operator.	Post-office address.	
		Local district.	Inspectors' district.	Township, etc.	County.	Railroad.			Nearest shipping station.	Name.
42	Spencer.....	Scranton	2	Dunmore Twp.....	Lackawanna.	L. V. R. R.....	Dunmore	A. D. and F. M. Spencer.....	Dunmore.
74	Meadow Brook	do	2	20th Ward, Scranton	do	D. L. and W. R. R.....	Taylorville	William Connell & Co.....	Scranton.
75	National.....	do	2	do	do	do	do	do	do.
49	Manville a.....	do	2	18th Ward, Scranton	do	D. and H. C. Co. R. R.	Green Ridge	D. and H. Canal Co.....	Providence.
46	Leggitts Creek.....	do	1	1st Ward, Scranton	do	do	Providence	do	do.
45	Marvine.....	do	1	do	do	do	do	do	do.
48	Von Storch.....	do	2	2d Ward, Scranton	do	do	do	do	do.
47	Dickson.....	do	2	do	do	do	Green Ridge	do	do.
50	Green Ridge.....	do	2	Dunmore Twp	do	Erie R. R.	do	O. S. Johnson	Scranton.
	Richmond, Nos. 3, 4.....	do	1	Scranton Twp.....	do	N. Y., O. and W. Rwy.	Providence	Elk Hill Coal and Iron Co	do.
57	Mount Pleasant	do	2	14th Ward, Scranton	do	D. L. and W. R. R.	Scranton	Mount Pleasant Coal Co	do.
81	William A.....	Pittston	2	Old Forge Twp.....	do	L. V. R. R.	Lackawanna	Connell Coal Co.....	do.
	Lawrence.....	do	2	do	do	do	do	do	do.
88	Katy Did.....	do	3	do	do	Erie R. R.	Moosic	Robertson & Co.....	Moosic.
87	Central No. 13.....	do	3	do	do	E. and W. V. R. R.	Pleasant Valley	Pennsylvania Coal Co.....	Dunmore.
	Law Shaft.....	do	3	Pittston Twp.....	do	do	do	do	do.
86	Old Forge.....	do	2	Old Forge Twp.....	do	do	Lackawanna	do	do.
	Ewen Breaker.....	do	3	Jenkins Twp.....	do	do	Pittston	do	do.
109	Shaft No. 4.....	do	3	do	do	do	do	do	do.
110	Breaker No. 6.....	do	3	do	do	do	Port Blanchard	do	do.
	Breaker No. 8.....	do	3	Hughestownboro	do	do	Pittston	do	do.
99	Breaker No. 10.....	do	3	do	do	do	do	do	do.

a Operated jointly with Delaware, Lackawanna and Western Railroad Company.

Directory of anthracite coal mines in Pennsylvania—Continued.
NORTHERN COAL FIELD—Continued.

Map No.	Name of mine.	Location.					Operator.		
		Local district.	Inspectors' district.	Township, etc.	County.	Railroad.	Nearest shipping station.	Name.	Post-office address.
111	Breaker No. 14	Pittston	3	Jenkins Twp.	Luzerne	E. and W. V. R. R.	Port Blanchard	Pennsylvania Coal Co.	Dunmore.
100	Barnum	do	3	Marcy Twp.	do	do	Pittston Junction	do	Do.
112	Lafin	do	3	Jenkins Twp.	do	L. V. R. R.	Lafin	Lafin Coal Co.	Lafin.
	Crescent	do	3	do	do	do	Pittston	Crescent Coal Co.	Wilkesbarre.
	Miner	do	3	do	do	do	Miners Mills	Wm. B. Miner	Do.
91	Avoca	do	3	Pittston Twp.	do	do	Avoca	Avoca Coal Co., Limited	Avoca.
90	Langcliffe	do	3	Pittston	do	do	do	Langcliffe Coal Co.	Do.
	Ravine	do	3	do	do	do	Pittston	Newton Coal Mining Co.	Pittston.
102	Seneca	do	3	do	do	do	do	do	Do.
108	Hunt	do	3	Kingston Twp.	do	D., L. and W. R. R.	Wyoming	Wyoming C. and L. Co.	Scranton.
83	Halstead	do	3	Marcy Twp.	do	do	Duryea	D., L. and W. R. R. Co.	Do.
95	Butler	do	3	Pittston Twp.	do	L. V. R. R.	Pittston	Butler Mine Co., Limited	Pittston.
	Chapman	do	3	do	do	do	do	do	Do.
	Fernwood	do	3	do	do	N. Y., S. and W. R. R.	do	do	Do.
106	Schooley	do	3	Exeter Twp.	do	L. V. R. R.	West Pittston	Pennsylvania Coal Co.	Dunmore.
84	Columbia	do	3	Marcy Twp.	do	D., L. and W. R. R. and L. V. R. R.	Duryea	Old Forge Coal Mng. Co.	Pittston.
		do	3	do	do	do	do	do	Do.
85	Phoenix	do	3	do	do	do	Coxton	Babylon Coal Co.	Scranton.
82	Babylon	do	3	do	do	L. V. R. R.	do	do	Do.
89	Consolidated	do	3	Pittston Twp.	do	Erie R. R.	Moosic	Hillside Coal and Iron Co.	Do.
103	Clear Spring	do	3	West Pittston	do	D., L. and W. R. R.	West Pittston	Clear Spring Coal Co.	Pittston.

Directory of anthracite coal mines in Pennsylvania—Continued.
NORTHERN COAL FIELD—Continued.

Map No.	Name of mine.	Location.					Operator.		
		Local district.	Inspectors' district.	Township, etc.	County.	Railroad.	Nearest shipping station.	Name.	Post-office address.
	Louise.....	Pittston.....	3	West Pittston.....	Luzerne.....	L. V. R. R.	West Pittston.....	Raub Coal Co.....	Luzerne.
94	Elmwood.....	do.....	3	Pittston Twp.....	do.....	do.....	Avoca.....	Florence Coal Co., Limited.....	DuPont.
113	Ridgewood.....	do.....	3	Plains Twp.....	do.....	N. Y., S. and W. R. R.	Mill Creek.....	Keystone Coal Co.....	Wilkesbarre.
104	Stevens.....	do.....	3	Exeter Twp.....	do.....	L. V. R. R.	Exeter.....	Stevens Coal Co.....	Soranton.
107	Mount Lookout.....	do.....	3	do.....	do.....	D., L. and W. R. R. and L. V. R. R.	do.....	Mount Lookout Coal Co.....	Do.
	Morning Star.....	do.....	3	do.....	do.....	L. V. R. R.	Wyoming.....	J. A. Hutchins.....	Wyoming.
105	Exeter.....	do.....	3	do.....	do.....	do.....	West Pittston.....	Lehigh Valley Coal Co.....	Wilkesbarre.
92	Heidelberg No. 1.....	do.....	3	Pittston Twp.....	do.....	do.....	do.....	do.....	Do.
93	Heidelberg No. 2.....	do.....	3	do.....	do.....	do.....	do.....	do.....	Do.
133	Diamond No. 1.....	Wilkesbarre.....	4	Wilkesbarre.....	do.....	C. R. R. of New Jersey	Ashley.....	L. and W. Coal Co.....	Do.
132	Hollenback No. 2.....	do.....	4	do.....	do.....	do.....	Wilkesbarre.....	do.....	Do.
134	Empire No. 4.....	do.....	4	do.....	do.....	do.....	Ashley.....	do.....	Do.
137	S. Wilkesbarre No. 5.....	do.....	4	do.....	do.....	do.....	S. Wilkesbarre.....	do.....	Do.
135	Stanton No. 7.....	do.....	4	do.....	do.....	do.....	Ashley.....	do.....	Do.
138	New Jersey No. 8.....	do.....	4	Hanover Twp.....	do.....	do.....	do.....	do.....	Do.
139	Sugar Notch No. 9.....	do.....	4	do.....	do.....	do.....	Sugar Notch.....	do.....	Do.
	Maxwell No. 20.....	do.....	4	do.....	do.....	do.....	do.....	do.....	Do.
143	Wanamie No. 18.....	do.....	4	Newport Twp.....	do.....	do.....	Wanamie.....	do.....	Do.
142	Alden.....	do.....	4	do.....	do.....	do.....	Alden.....	Alden Coal Co.....	Alden.
148	Melville.....	do.....	4	do.....	do.....	do.....	Lee.....	Melville Coal Co.....	Wilkesbarre.
120	Red Ash No. 1.....	do.....	4	Wilkesbarre Twp.....	do.....	do.....	Ashley.....	Red Ash Coal Co.....	Do.

NORTHERN COAL FIELD—Continued.

Map No.	Location.				Operator.				
	Name of mine.	Local district.	Inspector's district.	Township, etc.	County.	Railroad.	Nearest shipping station.	Name.	Post-office address.
131	Red Ash No. 2.	Wilkesbarre.	4	Wilkesbarre Twp.	Luzerne	C. R. R. of New Jersey	Ashley	Red Ash Coal Co.	Wilkesbarre.
144	Colliery No. 1.	do	4	Hanover Twp.	do	P. R. R.	Nanticoke	Susquehanna Coal Co.	do.
145	Colliery No. 2.	do	4	do	do	do	do	do	do.
146	Colliery No. 5.	do	4	do	do	do	do	do	do.
147	Colliery No. 6.	do	4	Newport Twp.	do	do	Glen Lyon	do	do.
117	Wyoming	do	4	Hanover Twp.	do	C. R. R. of New Jersey	Sugar Notch.	Wyoming Coal Co.	Sugar Notch.
141	Bennett	do	4	Plains Twp.	do	do	Mill Creek	North American Coal Co.	Wilkesbarre.
141	Warrior Run	do	4	Hanover Twp.	do	L. V. R. R.	Warrior Run	A. J. Davis & Co.	do.
149	West End No. 1.	do	4	Conyngham Twp.	do	P. R. R.	Mocanqua.	West End Coal Co.	Shickshinny.
140	Hadleigh	do	4	Hanover Twp.	do	C. R. R. of New Jersey	Sugar Notch	Crescent Coal Co.	Wilkesbarre.
129	Hillman Vein.	do	4	Wilkesbarre Twp.	do	do	Wilkesbarre.	Hillman Vein Coal Co.	do.
136	Franklin	do	4	do	do	do	Ashley	Lehigh Valley Coal Co.	do.
120	Henry	do	3	Plains Twp.	do	do	Port Bowkley	do	do.
122	Prospect.	do	3	do	do	do	do	do	do.
123	Dorrance	do	3	Wilkesbarre Twp.	do	do	do	do	do.
121	Wyoming	do	3	Plains Twp.	do	do	do	do	do.
116	Algonquin	do	3	do	do	N. Y., S. and W. R. R.	Miners Mills	Algonquin Coal Co.	do.
125	Laurel Run.	do	3	do	do	do	Parsons	Laurel Run Coal Co.	do.
126	Baltimore Slope	do	4	Wilkesbarre Twp.	do	D. and H. C. Co. R. R.	do	D. and H. Canal Co.	Providence.
127	Baltimore Tunnel.	do	4	do	do	do	do	do	do.
128	Conyngham	do	4	do	do	do	Wilkesbarre	do	do.

Directory of anthracite coal mines in Pennsylvania—Continued.
NORTHERN COAL FIELD—Continued.

Map No.	Name of mine.	Location.					Operator.		
		Local district.	Inspectors' district.	Township, etc.	County.	Railroad.	Nearest shipping station.	Name.	Post-office address.
114	Delaware.....	Wilkesbarre..	3	Plains Twp.....	Luzerne.....	D. and H. C. Co. R. R.	Mill Creek.....	D. and H. Canal Co.....	Providence.
168	Lance No. 11.....	Plymouth.....	4	Plymouth.....	do.....	C. R. R. of New Jersey	Plymouth.....	L. and W. Coal Co.....	Do.
169	Nottingham No. 15.....	do.....	4	do.....	do.....	do.....	do.....	do.....	Do.
	Chauncey.....	do.....	4	do.....	do.....	D., L. and W. R. R.	do.....	Reynolds & Meyer Coal Co.	Kingston.
170	Reynolds No. 16.....	do.....	4	do.....	do.....	C. R. R. of New Jersey	do.....	L. and W. Coal Co.....	Wilkesbarre.
172	Avondale.....	do.....	4	Plymouth Twp.....	do.....	D., L. and W. R. R.	Avondale.....	D., L. and W. R. Co.....	Scranton.
	Anchincloss.....	do.....	4	do.....	do.....	do.....	do.....	do.....	Do.
	Bliss.....	do.....	4	do.....	do.....	do.....	do.....	do.....	Do.
160	Woodward.....	do.....	4	do.....	do.....	do.....	Kingston.....	do.....	Do.
166	Dodson.....	do.....	4	do.....	do.....	do.....	Plymouth.....	Plymouth Coal Co.....	Do.
155	East Boston.....	do.....	3	Kingston.....	do.....	D., L. and W. R. R., P. R. R., and L. V. R. R.	Kingston.....	W. G. Payne & Co.....	Wilkesbarre.
171	Parish.....	do.....	4	Plymouth.....	do.....	C. R. R. of New Jersey	Plymouth.....	Farrish Coal Co.....	Kingston.
	Buttonwood.....	do.....	4	do.....	do.....	do.....	do.....	do.....	Plymouth.
173	Colliery No. 3.....	do.....	4	West Nanticoke.....	do.....	P. R. R.	West Nanticoke.....	Susquehanna Coal Co.....	Do.
161	Boston.....	do.....	4	Plymouth Twp.....	do.....	D. and H. C. Co. R. R.	Plymouth.....	D. and H. Canal Co.....	Wilkesbarre.
162	Plymouth No. 2.....	do.....	4	do.....	do.....	do.....	do.....	do.....	Providence.
163	Plymouth No. 3.....	do.....	4	do.....	do.....	do.....	do.....	do.....	Do.
164	Plymouth No. 4.....	do.....	4	do.....	do.....	do.....	do.....	do.....	Do.
165	Plymouth No. 5.....	do.....	4	do.....	do.....	do.....	do.....	do.....	Do.

Directory of anthracite coal mines in Pennsylvania—Continued.
NORTHERN COAL FIELD—Continued.

Map No.	Name of mine.	Location.					Operator.		
		Local district.	Inspectors' district.	Township, etc.	County.	Railroad.	Nearest shipping station.	Name.	Post-office address.
159	Pettebone	Kingston	3	Kingston	Luzerne	D., L. and W. R. R.	Plymouth	D., L. and W. R. R. Co.	Providence.
156	Kingston No. 1	do	3	Kingston Twp.	do	do	do	Kingston Coal Co.	Kingston.
153	Kingston No. 2	do	3	do	do	do	do	do	Do.
	Kingston No. 3	do	3	do	do	do	do	do	Do.
157	Kingston No. 4	do	3	Kingston Twp.	do	do	do	do	Do.
167	Gaylord	do	4	Plymouth Twp.	do	do	do	do	Do.
152	Harry E	do	3	Kingston Twp.	do	do	Bennett	Temple Iron Co.	Wilkesbarre.
151	Forty Fort.	do	3	do	do	D., L. and W. R. R.	Maltby	do	Do.
154	Black Diamond	do	3	do	do	and L. V. R. R.	Kingston	Plymouth Coal Co.	Do.
153	Mill Hollow	do	3	do	do	do	Bennett	Thomas Waddell, Est. of ..	Pittston.
150	Maltby	do	3	do	do	L. V. R. R.	Maltby	Lehigh Valley Coal Co.	Wilkesbarre.

EASTERN MIDDLE COAL FIELD.

175	Upper Lehigh No. 2.	Green Mountain.	5	Butler Twp.	Luzerne	C. R. R. of New Jersey	Upper Lehigh ...	Upper Lehigh Coal Co.	Upper Lehigh.
176	Upper Lehigh No. 4.	do	5	do	do	do	do	do	Do.
191	Milnesville	Black Creek ..	5	Hasle Twp.	do	P. R. R.	Hasleton	A. S. Van Winkle & Co.	Milnesville.
188	Lattimer No. 1.	do	5	do	do	L. V. R. R. and D., S.	do	Calvin Pardee & Co.	Lattimer
189	Lattimer No. 2.	do		do	do	and S. R. R.	do	do	Mines.
190	Lattimer No. 3.	do		do	do	do	do	do	do

Directory of anthracite coal mines in Pennsylvania—Continued.
EASTERN MIDDLE COAL FIELD—Continued.

Map No.	Name of mine.	Location.				Operator.		
		Local district.	Inspectors' district.	Township, etc.	County.	Railroad.	Nearest shipping station.	Name. Post-office address.
177	Sandy Run	Black Creek	5	Foster Twp.....	Luzerne	C. R. R. of New Jersey	Sandy Run	M. S. Kemmerer & Co..... Sandy Run.
178	Highland No. 1	do	5	do	do	L. V. R. R.	Highlands	G. B. Markle & Co
179	Highland Nos. 2, 5	do	5	do	do	do	do	do
184	Jeddo No. 3	do	5	Hazle Twp	do	do	Jeddo	do
185	Jeddo No. 4	do	5	do	do	do	do	do
195	Derringer	do	5	Black Creek Twp.....	do	do	do	do
180	Drifton No. 1	do	5	Foster Twp	do	D. S. and S. R. R.	Derringer	Cross Creek Coal Co.....
181	Drifton No. 2	do	5	do	do	do	Drifton	do
183	Drifton No. 3	do	5	do	do	do	do	do
182	Eckley No. 5	do	5	Hazle Twp	do	do	do	do
182	Eckley No. 10	do	5	Foster Twp	do	do	Eckley	do
196	Gowen	do	5	do	do	do	do	do
194	Tomhocken	do	5	Black Creek Twp.....	do	do	Gowen	do
	Tomhocken	do	5	Sugar Loaf Twp.....	do	do	Tomhocken	do
	Oneida Nos. 1, 2, and 3.	do	6	North Union.....	Schuylkill.....	do	Oneida.....	do
197	Hazlebrook	Hazleton	5	Foster Twp.....	Luzerne	L. V. R. R.	Hazlebrook	J. S. Wents & Co
208	Harwood	do	5	Hazle Twp	do	D. S. and S. R. R.	Hazleton	Calvin Pardee & Co
198	Stockton	do	5	do	do	do	Stockton.....	Cross Creek Coal Co.....
207	Cranberry	do	5	do	do	L. V. R. R.	Hazleton	A. Pardee & Co..... Hazleton.

Directory of anthracite coal mines in Pennsylvania—Continued.
EASTERN MIDDLE COAL FIELD—Continued.

Map No.	Name of mine.	Location.					Operator.	
		Local district.	Insp. district.	Township, etc.	County.	Railroad.	Nearest shipping station.	Name. Post-office address.
	East Crystal Ridge.	Hazleton	5	Hazlet Twp.	Luzerne	L. V. R. R.	Hazleton	A. Pardee & Co. Hazleton.
205	Hazleton Nos. 1, 2.	do	5	Hazleton	do	do	do	Lehigh Valley Coal Co. Do.
204	Hazleton Nos. 3, 5.	do	5	do	do	do	do	Do. Do.
206	Hazleton No. 6.	do	5	do	do	do	do	Do. Do.
217	Beaver Brook.	Beaver Meadow.	5	do	do	L. V. R. R. and C. R. R. of New Jersey.	Andenried	C. M. Dodson & Co. Andenried.
211	Beaver Meadow.	do	5	Banks Twp.	Carbon	D., S. and S. R. R. and L. V. R. R.	Beaver Meadow.	Cross Creek Coal Co. Drifton.
218	Honeybrook No. 2.	do	5	do	do	C. R. R. of New Jersey.	Treskow	L. and W. Coal Co. Wilkesbarre.
219	Honeybrook No. 4.	do	6	Klein Twp.	Schuylkill	do	Andenried	Do. Do.
220	Honeybrook No. 5.	do	6	do	do	do	do	Do. Do.
221	Silver Brook No. 1.	do	6	do	do	L. V. R. R.	Silver Brook	Silver Brook Coal Co. Mauch Chunk.
	Silver Brook No. 2.	do	6	do	do	do	do	Do. Do.
212	Coleraine.	do	5	Banks Twp.	Carbon	do	Beaver Meadow.	A. S. Van Winkle & Co. Hazleton.
216	Spring Brook.	do	5	do	do	do	Andenried	Lehigh Valley Coal Co. Wilkesbarre.
218	Spring Mount No. 1.	do	5	Jeanesville.	do	do	Jeanesville	do. Do.
214	Spring Mount No. 4.	do	5	do	Luzerne	do	do	do. Do.

Directory of anthracite coal mines in Pennsylvania—Continued.
WESTERN MIDDLE COAL FIELD.

Map No.	Name of mine.	Location.					Operator.		
		Local district.	Inspectors' district.	Township, etc.	County.	Railroad.	Nearest shipping station.	Name.	Post-office address.
235	Ellengowan.....	East Mahanoy.....	6	Mahanoy Twp.....	Schuylkill.....	P. and R. Rwy.....	St. Nicholas.....	P. and R. Coal and Iron Co.	Pottsville.
230	Elmwood.....	do.....	6	do.....	do.....	do.....	Mahanoy City.....	do.....	Do.
236	Knickerbocker.....	do.....	6	do.....	do.....	do.....	Yatesville.....	do.....	Do.
229	Mahanoy City.....	do.....	6	Mahanoy City.....	do.....	do.....	Mahanoy City.....	do.....	Do.
228	North Mahanoy.....	do.....	6	Mahanoy Twp.....	do.....	do.....	do.....	do.....	Do.
227	Schuylkill.....	do.....	6	do.....	do.....	do.....	do.....	do.....	Do.
223	Suffolk.....	do.....	6	do.....	do.....	do.....	St. Nicholas.....	do.....	Do.
232	St. Nicholas.....	do.....	6	do.....	do.....	do.....	do.....	do.....	Do.
231	Tunnel Ridge.....	do.....	6	do.....	do.....	do.....	Mahanoy City.....	do.....	Do.
330	Middle Lehigh.....	do.....	7	do.....	do.....	L. V. R. R.....	New Boston.....	Mill Creek Coal Co....	New Boston.
228	Buck Mountain.....	do.....	6	do.....	do.....	do.....	Buck Mountain.....	do.....	Do.
331	Morea.....	do.....	8	do.....	do.....	P. R. R. and L. V. R. R.....	Morea.....	Dodson Coal Co.....	Morea Colliery.
222	Park No. 2.....	do.....	6	do.....	do.....	L. V. R. R.....	Park Place.....	Lentz, Lilly & Co.....	Park Place.
224	Primrose.....	do.....	6	do.....	do.....	do.....	Mahanoy City.....	Lehigh Valley Coal Co....	Wilkesbarre.
224	Maple Hill.....	do.....	6	do.....	do.....	P. and R. Rwy.....	St. Nicholas.....	P. and R. Coal and Iron Co.	Pottsville.
284	Alaska.....	West Mahanoy.....	7	Mount Carmel Twp.....	Northum'td.....	do.....	Alaska.....	do.....	Do.
283	Locust Gap.....	do.....	7	do.....	do.....	do.....	Locust Gap.....	do.....	Do.
282	Locust Spring.....	do.....	7	do.....	do.....	do.....	do.....	do.....	Do.
279	Merriam.....	do.....	7	do.....	do.....	do.....	Locust Summit.....	do.....	Do.
280	Monitor.....	do.....	7	do.....	do.....	do.....	Locust Gap.....	do.....	Do.
281	Reliance.....	do.....	7	do.....	do.....	do.....	Mount Carmel.....	do.....	Do.

Directory of anthracite coal mines in Pennsylvania—Continued.
WESTERN MIDDLE COAL FIELD—Continued.

Map No.	Name of mine.	Location.					Operator.		
		Local district.	Inspectors' district.	Township, etc.	County.	Railroad.	Nearest shipping station.	Name.	Post-office address.
276	Mount Carmel	West Mahanoy	7	Mount Carmel Twp.	Northum'td	P. and R. Rwy., N. C. R. R., and L. V. R. R.	Mount Carmel	Thomas M. Righter & Co.	Pottsville.
274	Columbus No. 1	do	7	N. Conyngham Twp	Columbia	L. V. R. R.	do	Lehigh Valley Coal Co.	Wilkesbarre.
271	Centralia	do	7	do	do	do	Centralia	do	Do.
272	Logan	do	7	do	do	do	do	do	Do.
268	North Ashland	do	7	do	do	P. and R. Rwy	Continental	P. and R. Coal and Iron Co.	Pottsville.
278	Potts	do	7	do	do	do	Locust Dale	do	Do.
	Scotch Valley	Black Creek	7	Beaver	do	do	Scotch Valley	Scotch Valley Coal Co.	Glen City.
287	Bast	West Mahanoy	7	Butler Twp.	Schuylkill	P. and R. Rwy	Ashland	P. and R. Coal and Iron Co.	Pottsville.
247	Bear Ridge	do	6	West Mahanoy Twp.	do	do	Mahanoy Plane	do	Do.
238	Boston Run	do	6	Mahanoy Twp.	do	do	St. Nicholas	do	Do.
287	Bear Run	do	6	do	do	do	do	do	Do.
241	Gilberton	do	6	West Mahanoy Twp.	do	do	Gilberton	do	Do.
280	Girard Mammoth.	do	6	do	do	do	Raven Run	do	Do.
282	Hammond	do	6	Butler Twp.	do	do	Conner	do	Do.
248	Indian Ridge	do	6	West Mahanoy Twp.	do	do	Shenandoah	do	Do.
252	Kohinoor	do	6	do	do	do	do	do	Do.
277	Keystone	do	7	Butler Twp.	do	do	Locust Dale	do	Do.
249	Shenandoah City	do	6	West Mahanoy Twp.	do	do	Shenandoah	do	Do.
268	Tunnel	do	6	Butler Twp.	do	do	Ashland	do	Do.
250	Turkey Run	do	6	West Mahanoy Twp.	do	do	Shenandoah	do	Do.
251	West Shenandoah	do	6	do	do	do	do	do	Do.

Directory of anthracite coal mines in Pennsylvania—Continued.
WESTERN MIDDLE COAL FIELD—Continued.

Map No.	Name of mine.	Location.				Operator.			
		Local district.	Inspectors' district.	Township, etc.	County.	Railroad.	Nearest shipping station.	Name.	Post-office address.
285	Preston No. 3	West Mahanoy	7	Butler Twp.	Schuylkill	P. and R. Rwy	Girardville	P. and R. Coal and Iron Co.	Pottsville.
289	Big Mine Run	do	7	do	do	do	Ashland	Lehigh Valley Coal Co.	Wilkesbarre.
283	Cambridge	do	6	West Mahanoy Twp	do	do	Shenandoah	Cambridge Coal Co.	Shenandoah.
242	Draper	do	6	do	do	do	Gilberton	P. and R. Coal and Iron Co.	Pottsville.
239	Furnace	do	6	do	do	do	do	Furnace Coal Co.	Gilberton.
254	Kelley Run	do	6	do	do	do	Shenandoah	Thomas Coal Co.	Philadelphia.
245	Lawrence	do	6	do	do	do	Mahanoy Plane	Lawrence Coal Co	Pottsville.
255	William Penn	do	6	do	do	P. R. R.	Shaft	William Penn Coal Co.	Shaft.
258	Packer No. 2	do	6	do	do	L. V. R. R.	Lost Creek	Lehigh Valley Coal Co.	Wilkesbarre.
256	Packer No. 3	do	6	do	do	do	Shenandoah	do	Do.
257	Packer No. 4	do	6	do	do	do	do	do	Do.
259	Packer No. 5	do	6	Butler Twp.	do	do	Girardville	do	Do.
305	Bear Valley	Shamokin	7	Coal Twp.	Northum'ld	P. and R. Rwy	Shamokin	P. and R. Coal and Iron Co.	Pottsville.
283	Buck Ridge	do	7	do	do	do	Greenback	do	Do.
304	Burnside	do	7	do	do	do	Shamokin	do	Do.
299	Henry Clay	do	7	do	do	do	do	do	Do.
306	North Franklin	do	7	Zerbe Twp.	do	do	Trearton	do	Do.
297	Cameron	do	7	Coal Twp.	do	N. C. Rwy.	Shamokin	Mineral R. R. & Mining Co.	Wilkesbarre.
296	Lake Fidler	do	7	do	do	do	do	do	Do.
290	Hickory Ridge	do	7	do	do	do	Lancaster Switch	Union Coal Co	Shamokin.
291	Hickory Swamp	do	7	do	do	do	do	do	Do.
286	Pennsylvania	do	7	Mount Carmel Twp.	do	do	Mount Carmel	do	Do.
	Richards	do	7	do	do	do	do	do	Do.

Directory of anthracite coal mines in Pennsylvania—Continued.
WESTERN MIDDLE COAL FIELD—Continued.

Map No.	Name of mine.	Location.					Operator.		
		Local district.	Inspectors' district.	Township, etc.	County.	Railroad.	Nearest shipping station.	Name.	Post-office address.
287	Enterprise.....	Shamokin.....	7	Coal Twp.....	Northum'td.....	P. and R. Rwy.....	Excelsior.....	Enterprise Coal Co.....	Excelsior.
288	Excelsior.....	.....do.....	7	.....do.....	.....do.....	.....do.....	.....do.....	Excelsior Coal Co.....	Do.
289	Corbin.....	.....do.....	7	.....do.....	.....do.....	.....do.....	.....do.....	.....do.....	Do.
292	Colbert.....	.....do.....	7	.....do.....	.....do.....	N. C. Rwy.....	Lancaster Switch.....	Shipman Coal Co.....	Shamokin.
302	Nelson.....	.....do.....	7	.....do.....	.....do.....	P. & R. Rwy.....	Shamokin.....	J. Langdon & Co.....	Elmira, N. Y.
	Natalie.....	.....do.....	7	.....do.....	.....do.....	P. and R. Rwy.....	.....do.....	Natalie Anthracite Coal Co.	Mount Carmel.
	Royal Oak.....	.....do.....	7	.....do.....	Schuylkill.....	.....do.....	.....do.....	Royal Oak Coal Co.....	Shamokin.
275	Midvalley.....	.....do.....	7	Mount Carmel Twp.....	Northum'td.....	L. V. R. R.....	Mount Carmel.....	Midvalley Coal Co.....	Wilburton.
	Girard.....	.....do.....	7	.....do.....	.....do.....	P. R. R.....	.....do.....	Girard Coal Co.....	Mount Carmel.

SOUTHERN COAL FIELD.

307	Colliery No. 1.....	Panther Creek.....	5	Packer Twp.....	Carbon.....	C. R. R. of New Jersey.....	Nequehoning.....	Lehigh C. and N. Co.....	Lansford.
308	Colliery No. 4.....	do.....	5	do.....	do.....	do.....	Lansford.....	do.....	Do.
309	Colliery No. 5.....	do.....	5	do.....	do.....	do.....	do.....	do.....	Do.
	Colliery No. 6.....	do.....	5	do.....	do.....	do.....	do.....	do.....	Do.
311	Colliery No. 8.....	do.....	8	Rahn Twp.....	Schuylkill.....	do.....	Coaldale.....	do.....	Do.
310	Colliery No. 9.....	do.....	5	Packer Twp.....	Carbon.....	do.....	do.....	do.....	Do.
313	Colliery No. 10.....	do.....	8	Rahn Twp.....	Schuylkill.....	do.....	Tamaqua.....	do.....	Do.
314	Colliery No. 11.....	do.....	8	do.....	do.....	do.....	do.....	do.....	Do.
312	Colliery No. 12.....	do.....	8	do.....	do.....	do.....	Coaldale.....	do.....	Do.
315	Colliery No. 13.....	do.....	8	do.....	do.....	do.....	Tamaqua.....	do.....	Do.

Directory of anthracite coal mines in Pennsylvania—Continued.
SOUTHERN COAL FIELD—Continued.

Map No.	Name of mine.	Location.				Railroad.	Nearest shipping station.	Operator.	
		Local district.	Inspectors' district.	Township, etc.	County.			Name.	Post-office address.
	Sharp Mountain.	Panther Creek	8	Rahn Twp.	Schuylkill	P. and R. Rwy.	Tamaqua.	Dunkelburger & Co.	Tamaqua.
	Marion	E. Schuylkill.	8	East Norwegan Twp.	do.	do.	St. Clair.	Marion Coal Co.	St. Clair.
324	Eagle Hill	do.	8	Blythe Twp.	do.	do.	Cumbola.	P. and R. Coal and Iron Co.	Pottsville.
316	East Lehigh.	do.	8	Tamaqua	do.	do.	Tamaqua	Mitchell & Shepp	Tamaqua.
336	Vulcan	do.	8	Newcastle Twp.	do.	do.	St. Clair.	Mill Creek Coal Co.	New Boston.
321	Kaska William	do.	8	Blythe Twp.	do.	do.	Middleport	T. M. Dodson Coal Co.	S. Bethlehem.
	Palmer Vein.	do.	8	do.	do.	do.	do.	Tyler & McTurk	Philadelphia.
325	Pine Forest.	do.	8	East Norwegan Twp.	do.	do.	Mill Creek.	P. and R. Coal and Iron Co.	Pottsville.
322	Silver Creek.	do.	8	Blythe Twp.	do.	do.	Patterson.	do.	Do.
328	Mount Hope.	do.	8	East Norwegan Twp.	do.	do.	St. Clair.	Mount Hope Coal Co.	S. Bethlehem.
338	York Farm.	do.	8	do.	do.	do.	do.	Lehigh Valley Coal Co.	Wilkesbarre.
344	Glendower	W. Schuylkill.	8	Foster Twp.	do.	do.	Glen Carbon.	P. and R. Coal and Iron Co.	Pottsville.
850	Otto	do.	8	Reilly Twp.	do.	do.	Branch Dale.	do.	Do.
	St. Clair	E. Schuylkill.	8	East Norwegan Twp.	do.	do.	St. Clair.	St. Clair Coal Co.	St. Clair.
	Little Diamond.	W. Schuylkill.	8	Casa Twp.	do.	do.	Minersville.	Little Diamond Coal Co.	Schuylkill Haven.
342	Thomaston	do.	8	do.	do.	do.	Heckscherville.	P. and R. Coal and Iron Co.	Pottsville.
349	Phoenix Park.	do.	8	do.	do.	do.	Llewellyn	do.	Do.
343	Richardson	do.	8	Foster Twp.	do.	do.	Glen Carbon.	do.	Do.
339	Ellaworth	do.	8	Newcastle Twp.	do.	do.	Broad Mountain.	Davis Bros.	St. Clair.
	Jugular.	do.	8	do.	do.	do.	do.	Hefner & Whims.	Broad Mt.
	Albright	do.	8	Casa Twp.	do.	do.	Llewellyn	Albright Coal Co.	Pottsville.

Directory of anthracite coal mines in Pennsylvania—Continued.
SOUTHERN COAL FIELD—Continued.

Map No.	Name of mine.	Location.					Operator.		
		Local district.	Inspectors' district.	Township, etc.	County.	Railroad.	Nearest shipping station.	Name.	Post-office address.
	Stoddart.....	W. Schuylkill.	6	Cass Twp	Schuylkill	P. and R. Rwy	Gilberton	Stoddart Coal Co	Gilberton.
	Wolf Creek.....	do	8	do	do	do	Minersville	do	Do.
345	Oak Hill.....	do	8	do	do	do	do	Leisenring & Co.	Minersville.
	Pine Hill.....	do	8	do	do	do	do	Pine Hill Coal Co.	Pottsville.
352	Blackwood.....	do	8	do	do	L. V. R. R.	Blackwood	Lehigh Valley Coal Co	Wilkesbarre.
353	Middle Creek.....	Lykens Valley	8	Frasley Twp.	do	P. and R. Rwy	Swatara Switch.	P. and R. Coal and Iron Co.	Pottsville.
359	West Brookside.....	do	8	Porter Twp.	do	do	Brookside	do	Do.
355	Lincoln.....	do	8	Tremont Twp	do	do	Lorberry Junc.	do	Do.
358	Good Spring.....	do	8	do	do	do	do	do	Do.
360	Williamstown.....	do	7	Wiconisco Twp.	Dauphin	N. C. Rwy	Williamstown	Summit Branch Railroad Co	Wilkesbarre.
361	Short Mountain.....	do	7	do	do	do	Lykens	Lykens Valley Coal Co	Do.
	Mountain.....	do	8	Cass Twp	Schuylkill	P. and R. Rwy	Thomaston	Lamb, Davis & Co.	Shenandoah.
	Lorberry.....	do	8	Tremont Twp	do	do	Tremont	Loesch, Moore & Co	Tremont.
	Lytle.....	do	8	Cass Twp	do	do	Minersville	Lytle Coal Co.	Minersville.
	East Ridge.....	do	8	do	do	do	Heckscherville	East Ridge Coal Co	Do.

General officers of corporations named in foregoing directory.

Pennsylvania Coal Company, No. 1 Broadway, New York.
 Lehigh and Wilkesbarre Coal Company, No. 143 Liberty street, New York.
 Delaware, Lackawanna and Western Railroad Company, No. 26 Exchange place, New York.
 Delaware and Hudson Canal Company, No. 21 Cortlandt street, New York.
 Coxe Brothers & Co., No. 143 Liberty street, New York.
 Philadelphia and Reading Coal and Iron Company, Reading Terminal, Philadelphia.
 Lehigh Valley Coal Company, No. 26 Cortlandt street, New York.
 Lehigh Coal and Navigation Company, No. 108 South Fourth street, Philadelphia.
 Hillside Coal and Iron Company, No. 21 Cortlandt street, New York.
 New York, Susquehanna and Western Railroad Company, No. 21 Cortlandt street, New York.
 Susquehanna Coal Company, Broad Street Station, Philadelphia.
 Lykens Valley Coal Company, Broad Street Station, Philadelphia.
 Mineral Railroad and Mining Company, Broad Street Station, Philadelphia.
 Summit Branch Railroad Company, Broad Street Station, Philadelphia.
 Union Coal Company, Erie, Pennsylvania.
 New York, Ontario and Western Railway Company, 56 Beaver street, New York.
 Delaware, Susquehanna and Schuylkill Railroad Company, 143 Liberty street, New York.

PENNSYLVANIA BITUMINOUS COAL.

Total product in 1898, 65,165,133 short tons; spot value, \$43,352,588.

When in 1895 the bituminous coal product of Pennsylvania increased 10,304,765 short tons over that of 1894 a record was made both for increase and total product. In that case, however, the increase was the result of a reaction from the business depression and decreased output in the two preceding years, stimulated by a temporary boom in the iron and steel trade. In 1898 a different state of affairs prevailed, and the record of 1895 was broken. The total increase over 1897 was 10,737,870 short tons, breaking the record in 1895 by 433,115 tons. Moreover, the increase in 1898 was over a year whose product up to that time was the largest ever won. Remarkable as this great increase was, there is one feature connected with it which is of particular interest, and even more noticeable than the increased output. This feature is that presented by the statistics of coal mining by machinery. In 1897 there were 64 firms using machines as against 41 in 1896 and 7 in 1891. (Statistics for the years 1892-1895 are not available.) In 1898 the number had increased to 97, or 50 per cent more than in 1897. The number of machines in use increased from 72 in 1891 to 454 in 1896, 690 in 1897, and to 1,068 in 1898, the latter year showing an increase of a little more than 50 per cent over 1897. The number in use in 1898 was about 15 times what it was in 1891. A still more remarkable increase is shown in the machine-mined tonnage, which, beginning with 431,440 tons in 1891, increased in five years to 6,092,644. In 1897 the machine-mined product amounted to 8,925,293 short tons, and increased in 1898 to 16,201,010 tons, being 82 per cent more than the year before and 40 times the machine-mined product in 1891. Moreover, it is shown that

the increase in the tonnage won by machines represented about 70 per cent of the total increase in the State.

Values showed a slight average decline. In some counties the average prices were a little higher than in 1897, but the general average for the State shows a drop of 2 cents per ton. As the demand was fully up to the supply for practically the entire year, and operators were not compelled to reduce prices in order to find a market, the small decline may be attributed to the reduced cost of machine-mined coal and the further reduced cost per ton due to increased production.

PRODUCTION BY COUNTIES.

The effect of the increased activity in the iron and steel trade in 1898 is distinctly shown in the statistics of coal production in Fayette, Westmoreland, Allegheny, and Cambria counties. The first two embrace what is known as the Connellsville region, from which the principal portion of the supply of metallurgical coke is drawn. Fayette County's product in 1898 exceeded that of 1897 by 2,994,372 short tons, and reached the unprecedented total of 12,696,063 short tons. Westmoreland County increased its output to 11,414,989 short tons, a gain of 1,491,177 tons, and making the total output of the region in 1898 a little over 24,000,000 tons—one-third more than the total coal output of Illinois. Allegheny County is the center of the iron-making district of western Pennsylvania. The coal product of this county increased 1,673,958 short tons, while Cambria County, in which Johnstown is located, increased its coal product 1,323,511 short tons. Other noticeable increases were in Jefferson County, 928,109 tons; Somerset County, 921,791 tons; Washington County, 891,012 tons, and Clearfield County, 576,692 tons. The largest increase was in Fayette County; the greatest percentage of increase was made in Somerset County, whose output in 1898 was practically double that of 1897.

The statistics of production by counties in 1897 and 1898, together with the distribution of the product for consumption, are presented in the following tables:

Bituminous coal product of Pennsylvania in 1897, by counties.

County.	Number of mines.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Average price per ton.	Average number of days active.	Average number of employees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Allegheny ..	83	6,818,256	322,818	62,756	12,209	7,216,039	\$4,848,096	\$0.67	164	14,039
Armstrong ..	13	853,945	666	3,026	.....	857,637	601,561	.70	245	1,340
Beaver	6	92,619	6,340	587	.....	99,546	93,813	.94	191	242
Bedford	11	299,023	94,487	5,056	38,053	436,619	290,269	.66	206	862
Blair	5	409,965	3,305	6,602	73,103	492,975	345,023	.70	242	761
Butler	11	228,960	2,940	1,780	.....	233,689	146,610	.63	162	565
Cambria	60	4,929,522	182,665	42,283	262,480	5,416,950	3,582,044	.66	225	7,997
Center	13	510,791	9,948	361	.....	521,100	315,090	.61	218	734
Clarion	12	246,908	734	197	.....	247,839	164,692	.66	180	606
Clearfield ..	88	5,140,873	42,376	36,280	259,518	5,479,047	3,430,258	.63	217	8,505
Elk	7	961,629	3,756	4,118	.....	969,503	685,132	.70	249	1,574
Fayette	57	2,576,161	174,503	138,497	6,812,530	9,701,691	5,797,823	.60	224	9,097
Huntingdon ..	8	290,009	7,593	6,337	.....	303,939	209,381	.69	157	605
Indiana	11	513,565	3,597	310	24,495	541,967	371,448	.69	195	623
Jefferson ...	15	3,958,364	5,207	31,510	721,978	4,697,059	2,892,309	.62	240	5,321
Lawrence ...	5	194,386	446	454	.....	195,286	180,925	.93	199	560
Mercer	10	408,613	7,349	19,810	.....	435,772	317,964	.73	160	1,033
Somerset ...	24	892,161	13,118	2,292	17,036	924,607	572,163	.62	226	1,234
Tioga	9	914,040	17,389	5,283	1,341	938,053	1,118,451	1.19	203	2,069
Washington ..	40	3,807,605	26,491	28,565	.....	3,862,661	2,127,939	.55	157	6,624
Westmoreland	73	5,900,618	119,612	157,933	3,745,649	9,923,812	8,413,966	.85	220	12,295
Bradford	2	198,048	611	262	.....	198,921	215,556	1.08	235	326
Clinton										
Lycoming	2	117,092	5,470	700	.....	123,262	142,906	1.16	248	260
McKean										
Small mines ..	.....	.....	600,000	.....	.....	600,000	600,000	.....	.....	.....
Total ...	574	40,243,162	1,651,421	554,999	11,968,392	54,417,974	37,463,519	.69	205	77,272

Bituminous coal product of Pennsylvania in 1898, by counties.

County.	Num- ber of mines.	Loaded at mines for ship- ment.	Sold to local trade and used by em- ployees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Aver- age price per ton.	Aver- age num- ber of days active.	Aver- age number of em- ployees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Allegheny ..	88	8,299,087	492,522	97,863	525	8,889,997	\$6,279,507	\$0.71	209	13,556
Armstrong ..	14	778,614	34,731	5,059		818,404	558,924	.68	204	1,497
Beaver	10	212,932	7,267	3,656		223,855	205,659	.90	213	446
Bedford	14	328,534	4,460	4,829	118,684	456,507	301,025	.66	192	890
Blair	4	331,700	6,102	5,398	60,843	404,043	282,830	.70	254	675
Butler	9	150,226	993	1,063		161,312	109,737	.68	151	511
Cambria	89	6,113,831	57,916	61,890	506,824	6,740,461	4,437,670	.66	246	8,814
Center	16	705,398	7,856	921		714,175	429,698	.60	201	1,072
Clarion	15	276,291	663	1,177		278,131	167,488	.60	217	540
Clearfield	126	5,662,335	59,089	48,217	286,098	6,055,739	3,746,504	.62	228	8,482
Elk	7	853,080	13,575	6,830		873,485	636,413	.73	292	1,314
Fayette	71	4,312,322	50,532	198,620	8,134,589	12,696,063	7,778,959	.61	248	10,290
Huntingdon ..	9	302,999	3,653	5,955		312,607	206,000	.66	224	483
Indiana	13	535,939	3,284	1,000	23,568	563,791	378,784	.67	218	597
Jefferson	21	4,672,984	15,360	26,252	910,572	5,625,168	3,404,553	.61	206	6,045
Lawrence	6	180,351	855	3,602		185,408	164,254	.89	202	504
Mercer	10	297,262	5,868	13,539		316,669	222,926	.70	135	897
Somerset	31	1,799,795	10,926	13,271	22,406	1,846,398	1,134,821	.61	247	2,059
Tioga	11	904,440	9,486	6,842	992	921,760	1,068,836	1.16	200	1,994
Washington ..	43	4,675,020	29,140	49,513		4,753,673	2,768,771	.58	189	6,236
Westmore- land	78	6,310,153	101,345	176,754	4,826,737	11,414,989	8,147,435	.71	241	12,181
Bradford	2	188,160	395	203		188,758	179,431	.95	190	276
Clinton										
Lycoming	2	118,508	4,732	500		123,740	142,363	1.15	229	242
McKean										
Small mines ..			600,000			600,000	600,000			
Total ..	689	48,019,561	1,520,750	732,984	14,891,838	65,165,133	43,352,588	.67	229	79,611

Distribution of the bituminous coal product of Pennsylvania from 1889 to 1898.

Years.	Num- ber of mines.	Loaded at mines for ship- ment.	Sold to local trade and used by em- ployees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Aver- age price per ton.	Aver- age num- ber of days active.	Average number of em- ployees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
1889	24,059,913	1,590,651	332,937	10,190,588	36,174,089	\$27,953,315	\$0.77			53,790
1890	29,288,923	1,473,317	395,837	11,144,096	42,302,173	35,376,916	.84	232		61,333
1891	29,976,914	2,007,348	321,225	10,483,003	42,788,490	37,271,053	.87	223		63,661
1892	32,425,949	2,207,827	356,779	11,704,021	46,694,576	39,017,164	.84	223		66,655
1893	33,322,328	1,934,429	426,122	8,387,845	44,070,724	35,260,674	.80	190		71,931
1894	613 29,722,803	1,589,595	342,294	8,257,771	39,912,463	29,479,820	.74	165		75,010
1895	588 35,164,453	1,732,903	468,381	12,851,591	50,217,228	35,980,357	.72	206		71,130
1896	569 37,696,555	1,570,161	504,224	9,786,513	49,557,453	35,368,249	.71	206		72,625
1897	575 40,419,846	1,653,049	556,604	11,968,392	54,597,891	37,636,347	.69	205		77,599
1898	689 48,019,561	1,520,750	732,984	14,891,838	65,165,133	43,352,588	.67	229		79,611

The following table compares the production in 1897 with that of 1898, showing the increases and decreases by counties in the latter year. The production in 1896 is also shown.

Bituminous coal product of Pennsylvania since 1896, by counties.

[Short tons.]

County.	1896.	1897.	1898.	Increase, 1898.	Decrease, 1898.
Allegheny	7,856,867	7,216,039	8,889,997	1,673,958	.....
Armstrong	614,932	857,637	818,404	.....	39,233
Beaver	127,290	99,546	223,855	124,309	.....
Bedford	237,414	436,619	456,507	19,888	.....
Blair	360,987	492,975	404,043	.....	88,932
Bradford	53,519	41,588	22,508	.....	19,080
Butler	230,336	233,689	161,312	.....	72,377
Cambria	4,649,819	5,416,950	6,740,461	1,323,511	.....
Center	251,665	521,100	714,175	193,075	.....
Clarion	371,749	247,839	278,131	30,292	.....
Clearfield	4,812,017	5,479,047	6,055,739	576,692	.....
Clinton	134,569	157,333	166,250	8,917	.....
Elk	807,886	969,503	873,485	.....	96,018
Fayette	8,076,200	9,701,691	12,696,063	2,994,372	.....
Huntingdon	339,597	303,939	312,607	8,668	.....
Indiana	418,642	541,967	563,791	21,824	.....
Jefferson	4,508,077	4,697,059	5,625,168	928,109	.....
Lawrence	198,666	195,286	185,408	.....	9,878
Lycoming	83,230	91,735	98,118	6,383	.....
McKean	33,133	31,527	25,622	.....	5,905
Mercer	579,069	435,772	316,669	.....	119,103
Somerset	787,050	924,607	1,846,398	921,791	.....
Tioga	825,687	938,053	921,760	.....	16,293
Washington	4,039,976	3,862,661	4,753,673	891,012	.....
Westmoreland	8,559,076	9,923,812	11,414,989	1,491,177	.....
Small mines	600,000	600,000	600,000	.....	.....
Total	49,557,453	54,417,974	65,165,133	11,213,678	466,819
Net increase	a 659,775	4,860,521	10,746,859	.....	.....

a Net decrease.

The following table shows the total product since 1873:

Product of bituminous coal in Pennsylvania since 1873.

Year.	Short tons.	Year.	Short tons.
1873.....	13, 098, 829	1886.....	27, 094, 501
1874.....	12, 320, 000	1887.....	31, 516, 856
1875.....	11, 760, 000	1888.....	33, 796, 727
1876.....	12, 880, 000	1889.....	36, 174, 089
1877.....	14, 000, 000	1890.....	42, 302, 173
1878.....	15, 120, 000	1891.....	42, 788, 490
1879.....	16, 240, 000	1892.....	46, 694, 576
1880.....	21, 280, 000	1893.....	44, 070, 724
1881.....	22, 400, 000	1894.....	39, 912, 463
1882.....	24, 640, 000	1895.....	50, 217, 228
1883.....	26, 890, 000	1896.....	49, 557, 453
1884.....	28, 000, 000	1897.....	54, 417, 974
1885.....	26, 000, 000	1898.....	65, 165, 133

TENNESSEE.

Total product in 1898, 3,022,896 short tons; spot value, \$2,337,512.

Tennessee's coal production has exhibited an uninterrupted increase each year since 1893, the output in 1898 being 134,047 tons, or not quite 5 per cent more than in 1897, more than 50 per cent more than 1893, five years before, and reached a total of 3,000,000 tons for the first time in its history. Prices have steadily declined since 1892, when the average for the State was \$1.13 per ton. The average price in 1898 was 77 cents, a decline in six years of 36 cents, or practically 33 per cent. In this State it may be said that the introduction of machines has been directly due to the falling prices. They were needed to meet the lower prices, not to make them. Two companies installed machines in 1897; two more did so in 1898. Eight machines were in use in 1897, producing 47,207 tons of coal. In 1898 nineteen machines produced 152,002 short tons.

The details of production in 1897 and 1898, by counties, are shown in the following tables:

Coal product of Tennessee in 1897, by counties.

County.	Number of mines.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Average price per ton.	Average number of days active.	Average number of employees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Anderson....	7	551,065	2,597	4,034	.....	557,696	\$453,112	\$0.80	245	1,177
Campbell....	11	303,010	10,369	3,115	12,000	328,494	306,481	.93	142	1,108
Claiborne....	4	229,189	1,200	.....	40,538	270,927	199,559	.74	219	544
Hamilton....	2	139,967	1,381	1,630	68,981	211,959	167,243	.79	253	477
Marion....	3	201,775	2,363	977	107,126	312,241	281,300	.90	252	543
Morgan....	6	288,119	1,275	500	11,800	301,694	210,095	.70	279	532
Rhea....	3	9,149	.....	9,747	120,176	139,072	97,349	.70	266	325
Scott....	4	66,385	8,834	1,800	11,293	88,312	80,311	.91	121	425
Grundyl.....	3	194,398	988	4,323	129,031	328,740	226,994	.69	229	611
Putnam.....										
Roane.....	2	167,122	4,113	13,149	160,830	345,214	302,590	.88	256	595
White.....										
Small mines.....	.....	.....	4,500	.....	.....	4,500	4,500	.....	.....	.....
Total..	45	2,150,179	37,620	39,275	661,775	2,888,849	2,329,534	.81	221	6,337

Coal product of Tennessee in 1898, by counties.

County.	Number of mines.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Average price per ton.	Average number of days active.	Average number of employees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Anderson....	8	571,740	1,206	5,120	800	578,866	\$446,636	\$0.77	253	1,141
Campbell....	13	313,306	3,793	3,658	5,000	325,757	292,804	.90	166	1,292
Claiborne....	4	254,674	3,000	1,700	39,200	298,574	224,815	.75	228	411
Hamilton....	2	122,462	1,700	1,410	74,286	199,828	165,171	.83	263	530
Marion....	6	206,887	2,885	1,201	98,692	309,665	266,020	.86	268	616
Morgan....	7	249,824	500	1,700	87,268	339,292	164,230	.48	258	745
Rhea....	3	16,341	3,405	17,158	147,335	184,289	128,969	.70	250	292
Scott....	3	106,711	11,128	3,500	23,877	145,216	122,268	.84	194	314
Cumberland.....	3	158,398	773	4,364	99,821	263,356	186,680	.71	230	634
Grundyl.....										
Putnam.....	2	198,712	5,081	13,712	157,098	378,603	335,419	.90	273	668
Roane.....										
White.....	2	198,712	5,081	13,712	157,098	378,603	335,419	.90	273	668
Small mines.....	.....	.....	4,500	.....	.....	4,500	4,500	1.00	.....	.....
Total..	51	2,199,075	37,971	52,523	733,327	3,022,896	2,397,512	.77	234	6,643

Distribution of the coal product of Tennessee from 1889 to 1898.

Year.	Num- ber of mines.	Loaded at mines for shipment.	Sold to lo- cal trade and used by em- ployees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Aver- age price per ton.	Aver- age num- ber of days active.	Aver- age num- ber of em- ployees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
1889.....		1,334,424	29,101	23,034	539,130	1,925,689	2,338,309	\$1.21	.....	4,108
1890.....		1,482,357	41,982	23,583	621,713	2,169,585	2,395,746	1.10	263	5,082
1891.....		1,828,964	100,478	33,302	652,934	2,413,678	2,668,188	1.105	230	5,097
1892.....		1,448,262	55,452	17,037	571,313	2,092,064	2,355,441	1.13	240	4,926
1893.....		1,427,219	42,560	20,921	411,558	1,902,258	2,048,449	1.08	232	4,976
1894.....	43	1,571,406	59,985	28,993	520,495	2,180,879	2,119,481	.97	210	5,542
1895.....	44	1,808,056	51,923	25,477	650,138	2,535,644	2,349,032	.93	224	5,120
1896.....	45	1,990,538	43,752	40,343	588,473	2,663,106	2,281,295	.86	211	6,531
1897.....	45	2,150,179	37,620	39,275	661,775	2,888,849	2,329,534	.81	221	6,337
1898.....	51	2,199,075	37,971	52,523	*733,327	3,022,896	2,337,512	.77	234	6,643

In the following table is shown the total production, by counties, since 1895, with the increase and decrease in each county during 1898, as compared with the preceding year:

Coal product of Tennessee since 1895, by counties.

[Short tons.]

County.	1895.	1896.	1897.	1898.	Increase, 1898.	Decrease, 1898.
Anderson.....	431,368	456,510	557,696	578,866	21,170	.....
Campbell	340,395	384,337	328,494	325,757	.....	2,737
Claiborne	179,663	203,926	270,927	298,574	27,647	.....
Cumberland..	.....	120	.....	.....	.....	.....
Grundy	446,386	330,648	317,924	251,806	.....	66,118
Hamilton	174,306	163,810	211,959	199,828	.....	12,131
Marion.....	368,963	294,895	312,241	309,665	.....	2,576
Morgan	61,515	217,948	301,694	339,292	37,598	.....
Putnam	8,075	10,900	10,816	11,450	634	.....
Rhea.....	109,817	91,615	139,072	184,239	45,167	.....
Roane	129,744	169,255	173,383	170,556	.....	2,827
Scott	140,856	188,476	88,312	145,216	56,904	.....
White.....	140,056	146,166	171,831	203,047	31,216	.....
Other coun- ties and small mines	4,500	4,500	4,500	4,600	100	.....
Total...	2,535,644	2,663,106	2,888,849	3,022,896	220,436	86,389
Net increase..	354,765	127,462	225,743	134,047	134,047	.....

The annual output of the State since 1873 has been as follows:

Coal product of Tennessee from 1873 to 1898.

Year.	Short tons.	Year.	Short tons.
1873.....	350,000	1886.....	1,714,290
1874.....	350,000	1887.....	1,900,000
1875.....	360,000	1888.....	1,967,297
1876.....	550,000	1889.....	1,925,689
1877.....	450,000	1890.....	2,169,585
1878.....	375,000	1891.....	2,413,678
1879.....	450,000	1892.....	2,092,064
1880.....	641,042	1893.....	1,902,258
1881.....	750,000	1894.....	2,180,879
1882.....	850,000	1895.....	2,535,644
1883.....	1,000,000	1896.....	2,663,106
1884.....	1,200,000	1897.....	2,888,849
1885.....	1,440,957	1898.....	3,022,896

TEXAS.

Total product in 1898, 686,734 short tons; spot value, \$1,139,763.

Texas has enjoyed seven years of steadily increasing production of coal, the output in 1898 being 47,393 short tons, or about 7.5 per cent more than that of 1897. All of the increase in 1898 was in the production of bituminous coal, lignite production showing a decrease of about 20,000 tons. This caused an advance in the average price for the State, and made the total value approximately \$1,140,000. In no other year has the value reached \$1,000,000, the nearest to that figure being in 1894, when the total value was \$976,458. The statistics of production here presented and shown in the following tables do not include Maverick County, the mines at Eagle Pass not having reported any production since 1893:

Coal product of Texas in 1897, by counties.

County.	Num- ber of mines.	Loaded at mines for ship- ment.	Sold to local trade and used by em- ployees.	Used at mines for steam and heat.	Total product.	Total value.	Aver- age price per ton.	Aver- age num- ber of days active.	Aver- age number of em- ployees.
Bituminous:		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Erath	5	339,999	847	2,034	342,880	\$658,824	\$1.92	201	1,063
Montague									
Palo Pinto									
Parker									
Wise	2	79,847			79,847	134,014	1.68	300	325
Webb									
Lignite:									
Burleson	9	201,789	7,510	7,315	216,614	179,495	.88	204	388
Medina									
Milam									
Robertson									
Shelby									
Total.....	16	621,635	8,357	9,349	639,341	972,823	1.52	220	1,766

Coal product of Texas in 1898, by counties.

County.	Num- ber of mines.	Loaded at mines for ship- ment.	Sold to local trade and used by em- ployees.	Used at mines for steam and heat.	Total product.	Total value.	Aver- age price per ton.	Aver- age num- ber of days active.	Aver- age number of em- ployees.
Bituminous:		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Coleman	7	437,602	915	1,798	490,315	\$968,871	\$1.98	249	1,796
Erath									
Palo Pinto									
Parker									
Webb									
Wise	9	191,130	2,332	2,967	196,419	170,892	.87	224	344
Lignite:									
Bastrop									
Medina									
Milam									
Nacogdoches									
Robertson									
Total	16	678,732	3,247	4,755	686,734	1,139,763	1.66	245	2,130

The following table shows the statistics of coal production in the State since 1889:

Coal product of Texas since 1889.

Distribution.	1889.	1890.	1891.	1892.	1893.
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
Loaded at mines for shipment.	120,602	180,800	169,300	241,005	300,064
Sold to local trade and used by employees.....	6,552	1,840	900	4,460	462
Used at mines for steam and heat	1,062	1,800	1,900	225	1,680
Total	128,216	184,440	172,100	245,690	302,206
Total value.....	\$340,617	\$465,900	\$412,300	\$569,333	\$688,407

Distribution.	1894.	1895.	1896.	1897.	1898.
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
Loaded at mines for shipment.	417,281	475,157	522,177	621,635	678,732
Sold to local trade and used by employees.....	2,412	7,705	12,846	8,357	3,247
Used at mines for steam and heat	1,155	2,097	8,992	9,349	4,755
Total	420,848	484,959	544,015	639,341	686,734
Total value	\$976,458	\$913,138	\$896,251	\$972,323	\$1,139,763

UTAH.

Total product in 1898, 593,709 short tons; spot value, \$752,252.

The most noticeable feature of Utah's coal production in 1898 was the increased value. The product in 1898 was 72,149 short tons, or about 14 per cent larger than that of 1893, whereas the value showed an increase of \$134,022, or nearly 22 per cent. All of the increase, both in product and value, came from Carbon County, which contributed more than 90 per cent of the total. Production, by counties, in the last two years was as follows:

Coal product of Utah in 1897, by counties.

County.	Number of mines.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Average price per ton.	Average number of days active.	Average number of employees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Carbon	4	396,523	2,083	5,400	64,925	468,881	\$549,109	\$1.17	211	588
Summit.....	4	28,247	17,594	3,795	.....	49,636	63,114	1.27	171	104
Iron	3	.....	3,040	3	.....	3,043	6,007	1.97	144	12
Sanpete										
Uinta.....										
Total	11	424,770	22,667	9,198	64,925	521,560	618,230	1.19	204	704

Coal product of Utah in 1898, by counties.

County.	Number of mines.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Average price per ton.	Average number of days active.	Average number of employees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Carbon	6	460,082	4,138	6,800	86,606	557,426	\$697,683	\$1.25	262	611
Iron	4	.....	605	10	.....	615	1,507	2.45	38	12
Sanpete	2	2,500	2,240	.....	.....	4,740	7,750	1.64	87	28
Summit.....	6	20,934	4,459	3,135	.....	28,528	41,712	1.46	180	79
Emery and Uinta.....	2	2,200	100	100	.....	2,400	3,600	1.50	222	9
Total	20	485,716	11,542	9,845	86,606	593,709	752,252	1.27	243	739

For comparison with previous years, the following table, showing the distribution and value of the production since 1891, together with the statistics of labor employed and average working time, is given:

Distribution of the coal product of Utah since 1891.

Year.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Average price per ton.	Average number of days active.	Average number of employees.
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
1891	315,711	8,233	21,650	25,451	371,045	\$666,646	\$1.80	.....	621
1892	321,431	6,775	6,509	26,298	361,013	562,625	1.56	230	646
1893	350,423	7,649	4,258	50,875	418,205	611,092	1.48	226	576
1894	364,675	11,173	6,892	48,810	431,550	603,479	1.40	199	671
1895	376,479	25,097	7,253	63,027	471,836	617,349	1.31	203	670
1896	340,338	9,171	7,411	61,707	418,627	500,547	1.20	202	679
1897	424,770	22,667	9,198	64,925	521,560	618,230	1.19	204	704
1898	485,716	11,542	9,845	86,606	593,709	752,252	1.27	243	739

There are no records of the amount of coal produced in Utah prior to 1885. Since that time the annual output has been as follows:

Coal product of Utah since 1885.

Year.	Short tons.	Year.	Short tons.
1885.....	213, 120	1892.....	361, 013
1886.....	200, 000	1893.....	413, 205
1887.....	180, 021	1894.....	431, 550
1888.....	258, 961	1895.....	471, 836
1889.....	236, 651	1896.....	418, 627
1890.....	318, 159	1897.....	521, 560
1891.....	371, 045	1898.....	593, 709

VIRGINIA.

Total product in 1898, 1,815,274 short tons; spot value, \$1,070,417.

Both Tazewell and Wise counties, from which the principal portion (97 per cent in 1898) of Virginia's coal product is obtained, added considerably to their previous output, and the total product of the State increased 286,972 short tons over 1897. But what was made up in tonnage was lost in value, which was less than \$50,000 more than that of the year before. Wise County showed the greatest decline in value, from 66 cents per ton in 1897 to 57 cents in 1898. The average price for Tazewell County showed a decline of 1 cent. The product of Wise County increased 280,712 short tons and only \$92,781 in value. Outside of Tazewell and Wise counties the product fell off 67,417 short tons—\$81,502.

Details of the production in 1897 and 1898 are shown in the following tables:

Coal product of Virginia in 1897, by counties.

County.	Num- ber of mines.	Loaded at mines for ship- ment.	Sold to local trade and used by em- ployees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Aver- age price per ton.	Aver- age num- ber of days active.	Aver- age number of em- ployees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Chesterfield, Henrico, Montgom- ery, and Pulaski....	11	74, 012	4, 101	28, 469	1, 400	107, 968	\$136, 508	\$1. 26	123	896
Tazewell.....	2	524, 028	5, 652	7, 840	170, 818	708, 888	415, 778	. 59	289	660
Wise	8	371, 933	19, 264	6, 778	314, 007	712, 011	469, 637	. 66	249	818
Total...	21	969, 973	29, 017	43, 087	486, 225	1, 528, 867	1, 021, 918	. 67	213	2, 344

Coal product of Virginia in 1898, by counties.

County.	Num- ber of mines.	Loaded at mines for ship- ment.	Sold to local trade and used by em- ployees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Aver- age price per ton.	Aver- age num- ber of days active.	Aver- age number of em- ployees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Chesterfield, Henrico, Montgom- ery, and Pulaski....	10	32,946	7,390	200	.....	40,536	\$54,999	\$1.36	189	119
Tazewell	2	528,024	7,726	8,792	237,473	782,015	453,000	.58	210	752
Wise	8	468,215	4,443	7,242	512,818	992,723	562,418	.57	250	984
Total..	20	1,029,185	19,564	16,234	750,291	1,815,274	1,070,417	.59	230	1,855

Distribution of the coal product of Virginia from 1889 to 1898.

Year.	Num- ber of mines.	Loaded at mines for shipment.	Sold to local trade and used by em- ployees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Aver- age price per ton.	Aver- age num- ber of days active.	Aver- age number of em- ployees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
1889		782,881	13,179	7,516	112,210	965,786	\$804,475	\$0.93	.....	1,555
1890		608,641	17,002	4,908	153,460	784,011	589,925	.75	296	1,295
1891		583,082	16,685	3,178	133,454	736,399	611,054	.63	246	820
1892		527,304	20,721	6,611	120,569	675,205	578,429	.86	192	836
1893		714,188	20,578	4,609	80,964	820,339	692,748	.84	253	961
1894	28	1,015,713	21,162	4,690	187,518	1,229,083	933,576	.76	234	1,635
1895	22	1,024,200	15,173	22,338	306,613	1,368,324	869,873	.63	225	2,158
1896	29	824,042	40,951	38,540	351,190	1,254,723	848,851	.68	198	2,510
1897	21	969,973	29,017	43,087	486,225	1,528,302	1,021,918	.67	213	2,344
1898	20	1,029,185	19,564	16,234	750,291	1,815,274	1,070,417	.59	230	1,855

The total production of coal in Virginia since 1880 has been as follows:

Coal product of Virginia since 1880.

Year.	Short tons.	Value.	Average price per ton.	Average number of days active.	Average number of employees.
1880.....	112,000				
1881.....	112,000				
1882.....	112,000				
1883.....	252,000				
1884.....	336,000				
1885.....	567,000				
1886.....	684,951				
1887.....	825,263				
1888.....	1,073,000				
1889.....	865,786	\$804,475	\$0.93		1,555
1890.....	784,011	589,925	.75	296	1,295
1891.....	736,399	611,654	.83	246	820
1892.....	675,205	578,429	.86	192	836
1893.....	820,339	692,748	.84	253	961
1894.....	1,299,083	933,576	.76	234	1,635
1895.....	1,368,324	869,873	.63	225	2,158
1896.....	1,254,723	848,851	.68	198	2,510
1897.....	1,528,302	1,021,918	.67	213	2,344
1898.....	1,815,274	1,070,417	.59	230	1,855

WASHINGTON.

Total product in 1898, 1,884,571 short tons; spot value, \$3,352,798.

Except for a decline in the average price per ton which the coal product of Washington shared with that of most of the important producing States, the condition of the industry in 1898 was the best in the history of the State. Compared with 1897, which up to that time was the year of largest production, the output in 1898 exhibited an increase of 450,459 short tons, or 31.4 per cent, while the value increased \$575,111, or not quite 21 per cent. The proportionately smaller increase in value was, in Washington, not due to any reduced cost of production from the use of undercutting machines, as none were in use either in 1897 or 1898. Nor was there any apparent increase in the productive capacity per employee, the statistics for the two years showing that the average tonnage per man per day was the same in both years. It would appear, therefore, that the increased product was obtained at a sacrifice, if not of actual, at least, of possible profit.

The only strike reported in 1898 was at the mines of the Wilkeson Coal and Coke Company, in Pierce County. It lasted just twenty-four

hours. The coal-mining industry in Washington is confined practically to King, Kittitas, and Pierce counties, the output from other portions of the State being less than 2 per cent of the total. The production in 1897 and 1898, by counties, and distribution of the product for consumption, was as follows:

Coal product of Washington in 1897, by counties.

County.	Number of mines.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Average price per ton.	Average number of days active.	Average number of employees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Cowlitz	3	612	442	194	.....	1,248	\$4,102	\$3.29	74	25
King	11	552,461	3,759	27,246	22	583,488	1,180,572	2.02	230	1,261
Kittitas	4	369,151	1,078	428	.....	370,657	650,318	1.75	217	609
Pierce	3	420,132	1,825	10,813	25,624	458,394	892,155	1.95	261	769
Skagit	2	5,559	45	1,221	13,500	20,325	50,540	2.49	300	75
Whatcom....										
Total ...	23	1,347,915	7,149	39,902	39,146	1,434,112	2,777,687	1.94	236	2,739

Coal product of Washington in 1898, by counties.

County.	Number of mines.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Average price per ton.	Average number of days active.	Average number of employees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
King	11	725,811	22,742	37,253	.....	785,806	\$1,626,318	\$2.07	268	1,542
Kittitas	3	555,742	3,609	6,955	.....	566,396	702,048	1.24	259	735
Pierce	4	458,351	1,941	11,364	37,486	509,142	965,197	1.90	283	795
Cowlitz and Lewis	8	228	1,620	.....	.....	1,848	4,070	2.20	135	13
Skagit and Whatcom.	2	8,279	684	1,394	11,072	21,379	54,265	2.54	309	60
Total ...	23	1,748,411	30,636	56,966	48,558	1,884,571	3,352,798	1.78	270	3,145

Distribution of the coal product of Washington from 1889 to 1898.

Year.	Num- ber of mines.	Loaded at mines for shipment.	Sold to local trade and used by em- ployees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Aver- age price per ton.	Aver- age num- ber of days active.	Average number of em- ployees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
1889	.....	956,046	15,574	19,958	89,000	1,030,578	\$2,898,238	\$2.32	.....	2,667
1890	.....	1,212,621	17,249	17,019	16,800	1,263,689	3,426,590	2.71	270	2,206
1891	.....	1,008,496	12,025	20,428	15,300	1,056,249	2,487,270	2.31	211	2,447
1892	.....	1,150,865	9,802	40,085	12,675	1,213,427	2,763,547	2.28	247	2,564
1893	.....	1,186,109	18,888	48,506	11,374	1,264,877	2,920,876	2.31	241	2,757
1894	19	1,030,232	10,822	56,853	8,563	1,106,470	2,578,441	2.33	207	2,662
1895	22	1,108,868	16,320	43,249	22,973	1,191,410	2,577,958	2.16	224	2,840
1896	21	1,095,484	16,732	44,613	33,685	1,186,504	2,396,078	2.00	221	2,622
1897	23	1,347,915	7,149	39,902	39,146	1,434,112	2,777,687	1.94	236	2,739
1898	23	1,748,411	30,636	56,966	48,558	1,884,571	3,352,796	1.78	270	3,145

The total output of the State since 1895, by counties, with the increases and decreases in 1898, as compared with 1897, is shown in the following table:

Product of coal in Washington since 1895, by counties.

[Short tons.]

County.	1895.	1896.	1897.	1898.	Increase, 1898.	Decrease, 1898.
Cowlitz .....	.....	1,263	1,248	1,088	.....	160
King	435,971	481,710	583,488	785,806	202,318	.....
Kittitas	281,534	266,953	370,657	566,396	195,739	.....
Lewis .....	.....	.....	.....	760	760	.....
Pierce	437,029	419,568	458,394	509,142	50,748	.....
Skagit	20,326	18,548	13,825	12,226	.....	1,599
Whatcom ...	a 16,550	8,462	a 6,500	9,153	2,653	.....
Total ..	1,191,410	1,186,504	1,434,112	1,884,571	b 450,459	.....

a Including Thurston County.

b Net increase.

The annual product since 1885 has been as follows:

Product of coal in Washington since 1885.

Year.	Total product.	Total value.	Average price per ton.	Average number of employees.	Average number of days worked.
	<i>Short tons.</i>				
1885.....	380,250				
1886.....	423,525	\$952,981	\$2.25		
1887.....	772,601	1,699,746	2.19	1,571	
1888.....	1,215,750	3,647,250	3.00		
1889.....	1,030,578	2,393,238	2.32	2,657	
1890.....	1,263,689	3,426,590	2.71	2,006	270
1891.....	1,056,249	2,437,270	2.31	2,447	211
1892.....	1,213,427	2,763,547	2.28	2,564	247
1893.....	1,264,877	2,920,876	2.31	2,757	241
1894.....	1,106,470	2,578,441	2.33	2,662	207
1895.....	1,191,410	2,577,958	2.16	2,840	224
1896.....	1,195,504	2,396,078	2.00	2,622	221
1897.....	1,434,112	2,777,687	1.94	2,739	236
1898.....	1,884,571	3,352,798	1.78	3,145	270

WEST VIRGINIA.

Total product in 1898, 16,700,999 short tons; spot value, \$10,131,264.

West Virginia now holds undisputed title to third place among the coal-producing States, a distinction attained in 1896 and held for three years. In the year mentioned West Virginia's product exceeded that of Ohio by the small margin of 1,302 short tons. The next year, owing to the injury upon the Ohio coal trade by the miners' strike, the lead was increased to more than 2,000,000 tons, which was maintained and somewhat exceeded in 1898, although Ohio's product last year was 2,319,925 tons more than in 1897 and over 268,000 tons larger than West Virginia's output the year before. West Virginia's product in 1898 was, however, 2,452,840 tons more than in 1897, and about 133,000 tons more than the increase in Ohio's product.

West Virginia has had an unrivaled record in the history of coal mining in the United States. The records of the years prior to 1878 are incomplete and unreliable, but, beginning with an output of 1,120,000 tons in that year, production has increased each year with but one exception, until in 1898, twenty years later, the product exceeded 16,500,000 tons, fifteen times what it was in 1878, and indicating an average annual increase of 750,000 tons. The increase of nearly 2,500,000 tons in 1898, and a decrease of approximately 1,500,000 tons in the production of Illinois, put West Virginia within 1,900,000 tons, or about 10 per cent,

of that State, and if the ratios of increase in the two States in the past be taken as a guide for the future, Illinois will have dropped to third place at the close of the century—December 31, 1900. Taking the record of the two States for the last fifteen years, and dividing the time into periods of five years each, as the best method of showing the average increase in business, we find that for Illinois the average yearly production in the five years 1884 to 1888, inclusive, was, in round numbers, 12,400,000 tons. In the next five years, from 1889 to 1893, inclusive, the average yearly output was 16,553,000 tons, an increase of 33.5 per cent. In the five years ending in 1898 the average production was 18,650,000 tons, an increase of 12.5 per cent over the second period and of 50 per cent over the first. Dividing West Virginia's product in the same way, it is shown that the average output in the first five years was 4,223,000 short tons. In the second period it was 8,659,000 short tons, an increase of over 100 per cent, and in the final five years the average product was 13,368,000 short tons, 54 per cent more than in the second term and 3.2 times the average for the first five years. The figures, taken in connection with the statistics of the last three years, show that the production in each of these States in 1900, if not interfered with by strikes or other untoward conditions, will approximate 21,000,000 short tons.

In the subsequent tables the production is shown primarily by counties, but in comparing the production in 1898 with that of previous years and studying the wonderful development of the coal-producing regions, it will be of interest to consider the records of some of the important fields. Of these there are four—the Fairmont or Upper Monongahela and the Elk Garden or Upper Potomac in the northern portion of the State, and the Pocahontas or Flat Top and the New and Kanawha river fields in the southern portion. The most important of these four regions is the New and Kanawha river field, embracing Fayette and Kanawha counties, which should really be divided into two, as most of Fayette County is taken from what is classed by Prof. I. C. White, State geologist, as the New River coal areas, while the Kanawha County product and that of a few mines in the western part of Fayette County are drawn from the Alleghany or Kanawha coal areas. These are separate and distinct coal areas, but as they are drained by the same waters (the New and Gauley rivers uniting to form the Kanawha), and the principal part of the product of both is sent to market over the Chesapeake and Ohio Railroad, whose main line penetrates them, they might as well be considered together in a statistical report. In 1886 the output from New and Kanawha river field was 2,290,563 short tons. Two years later it had increased to 2,840,630 tons. In five years more (1893) it had increased over 40 per cent, to 4,099,112 tons, while in 1898 it amounted to 5,947,272 tons, an increase of nearly 50 per cent in the last five years.

The Pocahontas or Flat Top field embraces McDowell and Mercer counties in West Virginia and Tazewell County, Virginia. Probably

more than half of the product of Tazewell County, though credited to Virginia, is taken from the West Virginia side of the line, but as the opening is in Virginia and no accurate separation can be made, the entire product is given to Virginia. The mines of McDowell County did not begin shipping until 1889. In 1891 it produced more than either of the others, and since 1893 has produced more each year than the other two together. In 1888 Mercer and Tazewell counties produced 1,710,791 short tons of coal. In 1893 the product of the district was 3,815,280 tons, and in 1898 it was 5,521,160 tons.

The Fairmont or Upper Monongahela region, embracing Harrison and Marion counties, has shown the largest ratio of increase in the last ten years of all the coal-producing regions of West Virginia, Marion County taking the lead. In 1888 this district produced less than 500,000 tons. Five years later it produced over 1,250,000 tons, and this was more than doubled in the next five years, the product in 1898 amounting to 2,525,294 short tons.

The Upper Potomac region, which is the southern extension of the Cumberland field of Maryland, had a product in 1888 of 518,878 short tons, of which 90 per cent was from Mineral County. Five years later the product was 1,129,397 tons, of which Mineral County produced somewhat less than 60 per cent, while in 1898 the product increased to 1,531,562 short tons, of which Mineral County produced less than 40 per cent and Tucker County produced over 60 per cent.

The enterprise of the four railroads handling this product to market, the Baltimore and Ohio, the West Virginia Central and Pittsburg, the Chesapeake and Ohio, and the Norfolk and Western, is brought into sharp contrast with the manufacturing enterprise of the people of the State, for with the exception of a comparatively small amount used at the iron works in and around Wheeling, and at the salt works in Mason County, together with the ordinary domestic consumption and that of the transportation interests, practically all of West Virginia's coal is shipped out of the State. Of the 16,701,000 tons produced in West Virginia in 1898, probably 15,000,000 tons were consumed outside of its borders.

The use of machines in the mines of West Virginia showed a marked increase in 1898, although, compared with Pennsylvania, Ohio, and Illinois, it is still small. The number of companies having machine equipment increased from 13 in 1897 to 22 in 1898, the total number of machines in use increased from 47 to 86, and the machine-mined product from 673,523 tons to 1,323,929 tons—practically 100 per cent.

The time lost by strikes in 1898 was insignificant. The principal instances of disaffection occurred in Fayette County during April, and were of short duration—from ten to thirty days. Only 13 mines were affected throughout the State; the total number of men made idle was 1,137, and the total time lost was 23,519 days, an average of twenty-one days per man.

Considering the production in 1898 by counties, it is seen that the output increased in all the larger counties except Mercer, where the product decreased 81,522 short tons. The largest increase was in McDowell County, whose product in 1898 was 669,632 tons more than in 1897. Fayette came next, with an increase of 591,232 tons, followed by Kanawha with 434,339 tons, Marion with 374,506 tons, and Tucker with 100,711 tons.

The distribution for consumption by counties in 1897 and 1898 is shown in the following tables:

Coal product in West Virginia, in 1897, by counties.

County.	Num- ber of mines.	Loaded at mines for ship- ment.	Sold to local trade and used by em- ployees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Aver- age price per ton.	Aver- age num- ber of days active.	Average number of em- ployees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Barbour	2	55,494	560			56,054	\$31,528	\$0.56	253	83
Brooke	3	35,486	13,917	50		49,453	37,225	.75	218	76
Fayette	52	3,355,840	67,761	10,976	566,963	4,001,540	2,699,056	.67	190	6,293
Harrison ...	13	304,521	16,847	9,358	4,091	334,817	202,777	.61	188	637
Kanawha ...	27	814,614	54,000	6,457	45,090	920,161	655,882	.71	170	2,612
Marion	13	1,472,510	10,506	11,094	245,786	1,739,846	970,093	.56	258	2,206
Marshall ...	4	132,530	13,452	1,550		147,532	106,959	.72	218	272
Mason	4	54,892	64,117	1,936		120,945	98,581	.82	254	214
McDowell ..	30	2,240,348	21,595	9,308	964,093	3,235,344	1,812,907	.56	199	3,844
Mercer	8	709,287	5,694	3,337	197,373	915,691	531,726	.58	211	969
Mineral	4	574,537	5,743	240		580,520	396,688	.68	289	436
Mingo	10	366,616	1,904			368,520	232,046	.63	220	646
Ohio	7	74,105	37,155	649		111,909	72,190	.65	161	229
Preston	4	121,067	1,141	657	46,745	169,610	101,546	.60	264	213
Putnam	3	110,813	158			110,971	94,370	.85	126	413
Raleigh	5	337,224	1,456	560	25,165	364,405	209,914	.58	178	390
Taylor										
Tucker	6	516,449	5,677	2,438	319,942	844,508	574,816	.68	284	1,070
Grant										
Monongalia ..	3	36,075	112	84	15,064	51,335	34,089	.66	204	81
Small mines			125,000			125,000	125,000			
Total ..	196	11,312,406	446,795	58,694	2,430,262	14,248,159	8,987,893	.63	205	20,504

Coal product of West Virginia in 1898, by counties.

County.	Number of mines.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Average price per ton.	Average number of days active.	Average number of employees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Barbour	3	33,076	586	301	1,080	35,043	\$13,566	\$0.55	157	96
Brooke	3	64,875	13,100	80		78,055	59,013	.76	309	133
Fayette	59	3,785,509	46,211	13,632	742,310	4,592,772	3,927,487	.64	196	6,737
Hancock	2		40,912			40,912	40,162	.98	245	78
Harrison	13	384,077	14,065	2,008	10,192	410,942	307,327	.50	242	543
Kanawha	30	1,320,140	12,561	4,191	17,008	1,354,500	924,105	.68	194	2,737
Marion	19	1,847,402	13,563	9,536	243,651	3,114,352	1,123,376	.53	254	2,120
Marshall	3	183,293	9,983	1,966		195,232	127,946	.66	254	245
Mason	6	48,237	67,525	244		116,026	94,443	.81	226	267
McDowell	32	2,414,745	25,647	11,102	1,453,482	3,904,976	2,110,759	.54	215	3,661
Mercer	8	602,001	5,189	2,141	234,838	834,169	466,041	.56	241	901
Mineral	6	580,406	5,637	242		586,945	413,746	.71	253	552
Mingo	10	373,436	3,155	940		377,531	234,685	.60	219	749
Ohio	7	75,885	59,247	1,797		136,929	95,611	.70	243	173
Preston	5	163,104	1,104	2,118	66,277	232,603	130,746	.56	237	275
Putnam	2	203,278	3,129			206,407	132,261	.64	237	473
Taylor	5	242,114	17,920	112		260,146	139,200	.54	204	353
Tucker	7	541,252	4,867	4,008	395,090	945,217	656,575	.70	255	1,278
Grant	3	28,914	784	112	6,500	36,310	19,643	.54	208	77
Monongalia	2	74,019	1,611	1,006	40,296	116,932	88,572	.76	197	163
Raleigh										
Randolph										
Small mines			125,000			125,000	125,000			
Total	225	12,965,903	471,796	61,176	3,302,124	16,700,999	10,131,264	.61	218	21,607

Distribution of the coal product of West Virginia from 1839 to 1898.

Years.	Number of mines.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Average price per ton.	Average number of days active.	Average number of employees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
1839		4,764,900	493,287	37,368	933,336	6,231,890	\$5,068,584	\$0.82		9,952
1890		5,614,752	438,527	30,594	1,310,781	7,394,654	6,208,123	.84	237	12,236
1891		6,887,151	429,878	47,163	1,856,473	9,230,665	7,359,816	.80	237	14,227
1892		7,560,790	441,159	49,563	1,687,243	9,738,755	7,852,114	.80	228	14,967
1893		8,591,962	390,689	46,898	1,679,029	10,708,578	8,251,170	.77	219	16,524
1894	187	9,116,314	428,202	64,126	2,019,115	11,627,757	8,706,808	.75	196	17,824
1895	190	8,858,256	445,023	50,595	2,034,087	11,387,961	7,710,575	.68	195	19,159
1896	189	9,838,053	426,441	56,395	2,555,407	12,876,296	8,336,685	.65	201	19,078
1897	196	11,312,408	446,795	58,094	3,430,262	14,248,159	8,987,393	.63	205	20,504
1898	225	12,965,903	471,796	61,176	3,302,124	16,700,999	10,131,264	.61	218	21,607

The following table exhibits the production of coal in West Virginia during the last four years, by counties, with the increases and decreases in 1898:

Coal product of West Virginia from 1895 to 1898, by counties.

[Short tons.]

County.	1895.	1896.	1897.	1898.	Increase, 1898.	Decrease, 1898.
Barbour	13,306	24,064	56,054	35,643	.....	20,411
Brooke	74,841	43,424	49,453	78,055	28,602	.....
Fayette	3,264,825	3,533,572	4,001,540	4,592,772	591,232	.....
Grant	392	8,720	28	560	532	.....
Harrison ...	292,693	231,687	334,817	410,942	76,125	.....
Kanawha ...	1,134,798	1,116,883	920,161	1,354,500	434,339	.....
Logan	24,648	.....	.....	.....	.....	.....
McDowell ..	2,395,365	2,883,686	3,235,344	3,904,976	669,632	.....
Marion	1,257,563	1,511,903	1,739,846	2,114,352	374,506	.....
Marshall....	194,077	181,610	147,532	195,232	47,700	.....
Mason	120,766	100,136	120,945	116,026	.....	4,919
Mercer	687,364	939,082	915,691	834,169	.....	81,522
Mineral.....	675,610	556,586	580,520	586,345	5,825	.....
Mingo	26,370	211,593	368,520	377,531	9,011	.....
Monongalia.	67,510	43,297	51,307	35,750	.....	15,557
Ohio	169,834	133,525	111,909	136,929	25,020	.....
Preston.....	107,053	139,759	169,610	232,603	62,993	.....
Putnam	120,482	185,953	110,971	206,407	95,436	.....
Raleigh	88,188	92,136	83,178	99,852	16,674	.....
Randolph...	200	.....	.....	17,080	17,080	.....
Taylor.....	93,252	123,354	281,227	260,146	.....	21,081
Tucker	449,991	688,426	844,506	945,217	100,711	.....
Wayne	3,833	1,900	.....	.....	.....	.....
Other coun- ties and small mines	125,000	125,000	125,000	165,912	40,912	.....
Total.	11,387,961	12,876,296	14,248,159	16,700,999	2,452,840	.....

^a Net increase.

The following table has been prepared in order to show in detail the development of the four principal coal-producing districts of West Virginia, as discussed on a preceding page. The production of the Pocahontas or Flat Top district in this table includes that credited to Tazewell County, Virginia. There were two exceptions to a regular annual increase in the New and Kanawha River district, one in the Pocahontas district, four in the Fairmont, and two in the Upper Potomac. In each case the output in 1898 was the largest ever obtained.

Coal product of the principal districts of West Virginia.

Year.	New and Kanawha River district.	Pocahontas or Flat Top district.	Fairmont or Upper Monongahela district.	Upper Potomac or Elk Garden district.
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
1886.....	2, 290, 563	968, 484	406, 976	383, 712
1887.....	2, 379, 296	1, 357, 040	520, 064	503, 343
1888.....	2, 840, 630	1, 912, 695	473, 489	518, 878
1889.....	2, 669, 016	2, 290, 270	456, 582	666, 956
1890.....	3, 012, 414	2, 702, 092	600, 131	819, 062
1891.....	3, 632, 209	3, 137, 012	1, 150, 569	1, 062, 308
1892.....	3, 773, 021	3, 503, 260	1, 141, 430	942, 154
1893.....	4, 099, 112	3, 815, 280	1, 255, 956	1, 129, 397
1894.....	3, 650, 971	5, 059, 025	1, 655, 532	927, 220
1895.....	4, 399, 623	4, 044, 988	1, 550, 256	1, 125, 601
1896.....	4, 650, 455	4, 608, 113	1, 743, 590	1, 245, 012
1897.....	4, 921, 701	4, 859, 373	2, 074, 663	1, 425, 026
1898.....	5, 947, 272	5, 521, 160	2, 525, 294	1, 531, 562

The annual output since 1873 has been as follows:

Coal product of West Virginia since 1873.

Year.	Short tons.	Year.	Short tons.
1873.....	672, 000	1886.....	4, 005, 796
1874.....	1, 120, 000	1887.....	4, 881, 620
1875.....	1, 120, 000	1888.....	5, 498, 800
1876.....	896, 000	1889.....	6, 231, 880
1877.....	1, 120, 000	1890.....	7, 394, 654
1878.....	1, 120, 000	1891.....	9, 220, 665
1879.....	1, 400, 000	1892.....	9, 738, 755
1880.....	1, 568, 000	1893.....	10, 708, 578
1881.....	1, 680, 000	1894.....	11, 627, 757
1882.....	2, 240, 000	1895.....	11, 387, 961
1883.....	2, 335, 833	1896.....	12, 876, 296
1884.....	3, 360, 000	1897.....	14, 248, 159
1885.....	3, 369, 062	1898.....	16, 700, 999

The decrease in 1895 was the first break in a series of fifteen years. In each year since 1881 until the close of 1894 the product of West Virginia has shown an uninterrupted gain, the total increase in fourteen years amounting to 10,059,757 short tons, an average of 718,554 short tons per year. The decrease in 1895 brings the total increase since 1881 down to 9,819,961 short tons, and the average for fifteen years down to 654,664 short tons, while the increased product in 1896, 1897, and 1898

makes the total increase in eighteen years 15,132,999 short tons—a yearly average increase of 840,722 tons, as shown in the following table:

Annual increase in the coal product of West Virginia since 1880.

Year.	Short tons.	Year.	Short tons.
1881 over 1880	112, 000	1894 over 1893	919, 179
1882 over 1881	560, 000	Total increase in	
1883 over 1882	95, 833	fourteen years.	10, 069, 757
1884 over 1883	1, 024, 167	Decrease in 1895.....	239, 796
1885 over 1884	9, 062	Total increase in	
1886 over 1885	636, 734	fifteen years...	9, 819, 961
1887 over 1886	875, 824	1896 over 1895	1, 488, 335
1888 over 1887	617, 180	1897 over 1896	1, 371, 863
1889 over 1888	733, 080	1898 over 1897	2, 452, 840
1890 over 1889	1, 162, 774	Total increase in	
1891 over 1890	1, 826, 011	eighteen years.	15, 132, 999
1892 over 1891	518, 090	Average annual in-	
1893 over 1892	969, 823	crease.....	840, 722

WYOMING.

Total product in 1898, 2,863,812 short tons; spot value, \$3,664,190.

With an increased output of a little over 10 per cent more than that of 1897, Wyoming in 1898 produced more coal than Missouri, and became the third State in importance of coal production west of the Mississippi River, following Iowa (first) and Colorado (second). Among the Rocky Mountain States it stands second. The product in 1898 was 265,926 short tons larger than that of 1897 as against a gain of 258,262 tons from 1897 to 1896. In addition to these encouraging statistics there was an increase in the value in 1898 actually and proportionately larger than the increase in tonnage, for while the product increased 10 per cent the value increased nearly 17 per cent, and the average price per ton advanced from \$1.21 to \$1.28.

Machine equipment was installed in one mine in which hand mining had previously been exclusively practiced, increasing the total number of machines in use from 43 in 1897 to 48 in 1898. The tonnage won by machines increased from 555,526 in 1897 to 621,431 in 1898.

Sweetwater County is the most important of the coal producing counties, contributing about 45 per cent of the total. Uintah County, adjoining Sweetwater on the west, ranks second with about 20 per cent of the total. Carbon County, adjoining Sweetwater on the east, is fourth in rank and contributed about 13 per cent of the product in 1898. These three counties, which form the southwestern and south-

central portion of the State, produced together a little over 2,200,000 short tons of the product in 1898. Nearly all the remainder was mined in Sheridan and Weston counties, in the northeastern part of the State. The Sheridan and Weston county fields are reached by the Burlington and Missouri River Railroad while the other regions are penetrated by the Union Pacific Railroad.

The production by counties with the distribution for consumption in 1897 and 1898 is shown in the following tables:

Coal product of Wyoming for 1897, by counties.

County.	Num- ber of mines.	Loaded at mines for ship- ment.	Sold to local trade and used by em- ployees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Aver- age price per ton.	Aver- age num- ber of days active.	Average number of em- ployees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Carbon	4	332,808	4,748	16,342	.....	403,891	\$438,307	\$1.21	196	513
Sweetwater..	8	1,086,719	4,755	41,900	.....	1,133,434	1,232,086	1.09	214	1,362
Uintah	3	406,002	3,661	8,321	.....	417,984	474,590	1.14	215	541
Converse	3	497,089	2,641	37,351	50,976	577,997	806,906	1.50	263	506
Weston										
Johnson	2	62,538	2,042	.....	.....	64,580	74,116	1.15	223	125
Sheridan										
Total ..	20	2,435,091	17,845	93,974	50,976	2,597,886	2,136,604	1.21	219	3,137

Coal product of Wyoming in 1898, by counties.

County.	Num- ber of mines.	Loaded at mines for ship- ment.	Sold to local trade and used by em- ployees.	Used at mines for steam and heat.	Made into coke.	Total product.	Total value.	Aver- age price per ton.	Aver- age num- ber of days active.	Average number of em- ployees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
Carbon	5	350,450	5,434	16,466	.....	372,350	\$432,449	\$1.30	219	441
Sweetwater..	8	1,200,403	5,072	40,400	.....	1,245,875	1,394,766	1.13	243	1,474
Uintah	3	582,450	4,383	7,000	.....	593,833	809,806	1.46	243	770
Converse and Crook	2	48,318	1,100	6,000	.....	55,418	69,000	1.25	194	85
Fremont and Johnson	2	.....	4,350	25	.....	4,375	8,750	2.00	188	8
Sheridan and Weston	3	516,705	1,316	33,556	35,384	591,961	839,359	1.42	258	697
Total ..	23	2,698,326	21,655	108,447	35,384	2,863,612	3,664,190	1.28	242	3,475

MINERAL RESOURCES.

Distribution of the coal product of Wyoming from 1889 to 1898.

Year.	Number of mines.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Made into coke at the mine.	Total product.	Total value.	Average price per ton.	Average number of days active.	Average number of employees.
		<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>				
1889..		1,354,443	15,433	19,071		1,388,947	\$1,748,617			2,675
1890..		1,835,299	28,540	6,527		1,870,366	3,183,669		246	3,273
1891..		2,229,401	33,558	60,392	4,490	2,327,841	3,555,275	\$1.53		3,411
1892..		2,378,657	27,054	96,128	2,000	2,503,839	3,168,776	1.27	225	3,133
1893..		2,280,685	64,188	87,066	7,352	2,439,311	3,290,904	1.35	189	3,378
1894..	34	2,309,934	21,482	72,362	13,685	2,417,463	3,170,392	1.31	190	3,032
1895..	25	2,106,937	35,628	81,065	23,281	2,246,911	2,977,901	1.33	184	3,449
1896..	28	2,102,468	17,867	68,251	41,033	2,229,624	2,904,185	1.30	209	2,949
1897..	20	2,435,091	17,845	93,974	50,976	2,597,886	3,136,094	1.21	219	3,137
1898..	23	2,698,326	21,655	108,447	35,384	2,863,812	3,664,190	1.28	242	3,475

The output by counties during the last four years, with the increases and decreases in 1898 as compared with 1897, is presented in the following statement:

Coal product of Wyoming since 1895, by counties.

[Short tons.]

County.	1895.	1896.	1897.	1898.	Increase, 1896.	Decrease, 1898.
Carbon	350,504	363,257	403,891	372,350	.....	31,541
Converse	65,090	78,000	79,000	54,818	.....	24,182
Sweetwater...	1,158,125	1,047,042	1,133,434	1,245,875	112,441	.....
Uintah	230,684	313,433	417,984	593,833	175,849	.....
Weston	348,611	371,528	498,997	508,199	9,202	.....
Other counties	93,897	56,364	64,580	88,737	24,157	.....
Total ...	2,246,911	2,229,624	2,597,886	2,863,812	265,926	.....

a Net increase.

In the following table is shown the total output in the State since 1868, and the value of the total product since 1885:

Total product of coal in Wyoming.

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1868....	6,925	.....	1884....	902,620	.....
1869....	49,382	.....	1885....	807,328	\$2,421,984
1870....	105,295	.....	1886....	829,355	2,488,065
1871....	147,328	.....	1887....	1,170,318	3,510,954
1872....	221,745	.....	1888....	1,481,540	4,444,620
1873....	259,700	.....	1889....	1,388,276	1,748,617
1874....	219,061	.....	1890....	1,870,366	3,188,669
1875....	300,808	.....	1891....	2,327,841	3,555,275
1876....	334,550	.....	1892....	2,503,839	3,168,776
1877....	342,853	.....	1893....	2,439,311	3,290,904
1878....	333,200	.....	1894....	2,417,463	3,170,392
1879....	400,991	.....	1895....	2,246,911	2,977,901
1880....	527,811	.....	1896....	2,229,624	2,904,185
1881....	628,181	.....	1897....	2,597,886	3,136,694
1882....	707,764	.....	1898....	2,863,812	3,664,190
1883....	779,689	.....		

COKE.

By EDWARD W. PARKER.

[The ton used in this report is uniformly the short ton of 2,000 pounds.]

INTRODUCTION.

The statistics contained in the following pages have been assembled and are presented in a manner as nearly uniform with the preceding reports of the series as possible. Previous to the report for 1896 this paper on coke was prepared annually by the late Joseph D. Weeks, of Pittsburg, Pennsylvania, and the lines laid down by Mr. Weeks have been generally followed in the reports for 1896 and 1897 and in the present one. The plan adopted by Mr. Weeks was to limit the use of the word "coke" to the product obtained from bituminous coal by distilling or burning it in retorts, ovens, or pits, and which may be termed "oven coke." The statistics in no way refer to the coke obtained as a by-product in the manufacture of illuminating gas, where no attention is given to the quality of the coke product. Recent developments, however, in the construction of by-product ovens, where the by-products of gas, tar, and ammonia are given equal importance with the coke, render a slight departure from this rule necessary. So long as the coke is the primary product, and particularly when the coke is used for metallurgical purposes, its comprehension in these reports is necessary and proper. The increasing use of coke for domestic purposes and the building of large plants for making by-product coke make a deviation from the previous reports advisable. The completion of the plant of 400 ovens at Everett, near Boston, Massachusetts, has been attained as this report goes to press. The product from these ovens, while not being primarily blast furnace, foundry, or other metallurgical coke, will be the output from Otto-Hoffmann ovens similar to those at Johnstown and Otto, Pennsylvania, and, although made from coal to be drawn from Nova Scotia mines, may be properly considered as coming within the scope of these reports, and it will therefore be included. As the by-product coke industry develops and extends, as it is sure to do, the scope of this report will necessarily be enlarged. In anticipation of a demand for information as to the amount and value of gas and other products obtained from coal in the United States, the Survey has collected from the gas companies and by-product coke

producers the statistics of the production of gas, tar, ammonia, and gas-house coke during 1898, and these are presented in a separate chapter.

The work of compiling the returns from coke producers and of preparing the numerous tables contained in the following pages has been, as for several years past, performed by Miss Belle Hill, of Pittsburg, Pennsylvania, under the supervision of the writer. Miss Hill was associated with Mr. Weeks during the later years of his life, and her ability, knowledge, and experience have been the chief factors in making the reports as accurate and complete as they are, and in securing their prompt publication. Miss Hill has also compiled the returns from the gas companies, of which there were over a thousand. Her services merit special recognition.

The preparation of the report on the coal products—gas, tar, ammonia, and gas-house coke—has been confided to Dr. William B. Phillips, of Pittsburg.

The coal used in coking in the United States is drawn from all five of its great bituminous coal fields: (1) The Appalachian; (2) the Central; (3) the Western; (4) the Rocky Mountain, and (5) the Pacific coast. The Triassic fields in North Carolina and near Richmond, Virginia, and the northern field of Michigan do not produce any coke. The Appalachian field is the great source of supply, for while there are 13 coke-producing States outside of the Appalachian field to 9 within it, the output outside of the field in 1897 was only 546,954 short tons out of a total product of 13,288,984 short tons, and in 1898 the product outside the field was 660,824 tons out of a total of 16,047,209 tons. In 1896 the total output of coke was 11,788,773 short tons, of which 553,863 tons were made outside the Appalachian field, and in 1895 only 445,473 short tons out of a total of 13,333,714 short tons were made outside the great field. From this it will be seen that the States in the Appalachian coal field contribute more than 95 per cent of the total coke product of the United States. The product of Wisconsin is included in that of the 13 States outside the Appalachian field, although the coal from which it is made is drawn from the mines of Pennsylvania.

PRODUCTION OF COKE IN THE UNITED STATES.

The statistics of the production of coke in the United States, as presented in the following tables, show that the output in 1898 was more than 20 per cent in excess of that of any previous year in the history of the industry. Exclusive of the coke produced in gas-house retorts and which is not considered in these reports, the coke product of the United States in 1898 amounted to 16,047,209 short tons, against 13,288,984 short tons in 1897. The increase in product in 1898 as compared with the preceding year was 2,758,225 short tons, or 21 per cent. Prior to 1898 the maximum yearly product was obtained in 1895, when the output amounted to about 45,000 tons more than that of 1897. The percentage of increase in 1898 over 1895, therefore, was a very small

fraction less than that of the increase over 1897. Some idea of the rapid growth of the coke-making industry in the United States may be gained from a subsequent table, which shows that the product in 1898 was 7,500,000 tons, or nearly 90 per cent more than that of 1888, and nearly five times that of 1880, the first year of which there is any record.

Notwithstanding the fact that the enormous production in 1898 was induced by a demand which was, for a greater part of the year, at least, fully up to the supply, there was a decline in values, the average price per ton falling from \$1.66 in 1897 to \$1.59 in 1898. The aggregate value showed an increase from \$22,102,514 in 1897 to \$25,586,699 in 1898—a total gain of \$3,484,185, or 16 per cent, as compared with 21 per cent increase in production. All of the more important coke-producing States shared in the decline in price. In Pennsylvania the average price per ton declined from \$1.53 to \$1.50; in West Virginia, from \$1.31 to \$1.26; in Alabama, from \$2.14 to \$2.03; in Virginia, from \$1.40 to \$1.32; in Colorado, from \$2.92 to \$2.59, and in Tennessee, from \$1.81 to \$1.63. These six States, named in the order of their producing rank, contributed 15,703,907 short tons, or 98 per cent of the total product in 1898. Tennessee, the smallest of the six in producing importance, had a product in 1898 of 394,545 short tons. Outside of these six no other State produced as much as 100,000 tons, and only two, Montana and Ohio, had a product exceeding 50,000 tons. All of the six leading States increased their production in 1898. Pennsylvania's production increased 1,748,378 short tons, or 19.5 per cent; West Virginia's increased 452,405 short tons, or 30.7 per cent; Alabama's increased 220,003 tons, or 15.25 per cent; Virginia's, 177,094 tons, or 50 per cent; Colorado's 132,155 tons, or 38.57 per cent, while Tennessee's increase was only 7 per cent, or 25,776 tons. On account of this comparatively small increase Tennessee dropped from fourth to sixth place in rank, while Virginia and Colorado were each advanced a point. Pennsylvania, West Virginia, and Alabama maintain the positions held in 1896 and 1897.

It must be borne in mind that in the foregoing statements, as well as in the tables following, the production of New York is included in Pennsylvania (from which the coal is drawn), and that Colorado includes the production of Utah, but in neither of the included States was the production sufficiently large to affect the totals or percentages.

The number of establishments in 1898 was 342, against 336 in 1897, a gain of 6. The number of ovens built increased from 47,668 in 1897 to 48,447 in 1898. At the close of 1897 545 ovens were in course of construction, including 120 Semet Solvay by-product ovens building at Ensley, Alabama; at the close of 1898, 1,048 ovens were in course of construction, including 400 Otto-Hoffmann by-product ovens at Everett, near Boston, Massachusetts, and 100 more of the same type in the Allegheny-Mountain district (Johnstown), Pennsylvania. The total number of by-product coke ovens in existence at the close of 1898

was 550, including 280 Semet-Solvay, 180 Otto-Hoffmann, and 90 Newton-Chambers; 30 of the last, however, not being operated as by-product ovens, leaving 520 active. In 1897 the number of active by-product ovens in existence was 280. On December 31, 1897, 195 by-product ovens were building, all of which were completed in 1898; and the close of the latter year saw 500 more in course of construction, 400 of which were put into operation in the summer of 1899.

In the following table will be found a statement of the production of coke in the United States in 1898, by States, followed, for purposes of comparison, by similar tables for 1897 and 1896:

Manufacture of coke in the United States, by States and Territories, in 1898.

State or Territory.	Estab-lish-ments.	Ovens.		Coal used.	Yield of coal in coke.	Coke pro-duced.	Total value of coke.	Value of coke per ton.
		Built.	Build-ing.					
				<i>Short tons.</i>	<i>Per ct.</i>	<i>Short tons.</i>		
Alabama	25	5,456	100	2,814,615	59	1,663,020	\$3,378,946	\$2.03
Colorado (a)....	12	1,253	3	803,686	59.1	474,808	1,230,428	2.59
Georgia	2	350	0	81,108	61	49,529	77,230	1.56
Illinois	2	126	0	6,650	35	2,325	4,686	2.02
Indiana	2	94	0	4,065	44.9	1,825	3,194	1.75
Indian Territory	2	130	0	73,330	46.5	34,110	96,639	2.833
Kansas	6	47	50	7,856	53	4,180	6,455	1.544
Kentucky	5	292	2	44,484	50	22,242	32,213	1.448
Massachusetts..	1	0	400	0	0	0	0	0
Missouri	3	8	0	1,500	49.3	740	1,050	1.42
Montana	4	318	0	92,552	56	52,009	359,174	6.906
New Mexico....	3	190	0	12,557	55.6	6,980	14,625	2.095
New York (b)...	1	25	0					
Ohio	10	441	0	134,757	63.5	85,535	211,558	2.47
Pennsylvania (c)	151	27,157	292	16,307,841	65.7	10,715,302	16,078,505	1.50
Tennessee	15	1,949	40	722,356	54.6	394,545	642,920	1.63
Utah (d)	1	104	0					
Virginia	6	1,564	0	852,972	62	531,161	699,761	1.317
Washington....	2	90	0	48,559	62.2	30,197	128,933	4.27
West Virginia..	87	8,659	161	3,145,398	61.2	1,925,071	2,432,657	1.26
Wisconsin.....	1	120	0	59,900	59	35,280	123,480	3.50
Wyoming	1	74	0	35,384	51.9	18,350	64,225	3.50
Total	342	648,447	1,048	25,249,570	63.6	16,047,209	25,586,699	1.594

a Includes production of Utah.

b Production included with Pennsylvania.

c Includes production of New York.

d Production included with Colorado.

e Includes 280 Semet-Solvay, 180 Otto-Hoffmann, and 90 Newton-Chambers by-product ovens.

f Includes 500 Otto-Hoffmann ovens.

In the following tables are given, by States, a statement of the production of coke in the United States in 1897 and 1896:

Manufacture of coke in the United States, by States and Territories, in 1897.

State or Territory.	Estab- lish- ments.	Ovens.		Coal used.	Yield of coal in coke.	Coke pro- duced.	Total value of coke.	Value of coke per ton.
		Built.	Build- ing.					
				<i>Short tons.</i>	<i>Per. ct.</i>	<i>Short tons.</i>		
Alabama	25	5,365	a120	2,451,475	58.8	1,443,017	\$3,094,461	\$2.14
Colorado (b)	12	c1,273	0	616,592	55.6	342,653	999,216	2.916
Georgia	1	300	0	67,000	49.3	33,000	42,240	1.28
Illinois	2	126	0	3,591	43	1,549	2,895	1.87
Indiana	2	94	0	7,022	41.4	2,904	5,795	1.995
Indian Territory ..	2	130	0	68,495	44.3	30,364	104,725	3.45
Kansas	4	57	0	11,772	52.5	6,181	9,272	1.50
Kentucky	5	268	0	64,234	50	32,117	45,454	1.41
Missouri	3	15	0	4,627	56	2,593	3,890	1.50
Montana	3	303	0	139,907	48.5	67,849	467,481	6.89
New Mexico	2	126	0	2,585	55.6	1,438	3,232	2.25
New York (d)	1	25	0					
Ohio	9	433	0	151,545	62.7	95,087	235,784	2.48
Pennsylvania (e) ..	153	26,910	307	13,538,646	66.2	8,966,924	13,727,966	1.53
Tennessee	15	1,948	0	667,996	55	368,769	667,656	1.81
Texas	1	20	0	700	56.3	394		
Utah (f)	1	104	0					
Virginia	6	1,453	110	574,542	61.6	354,067	495,864	1.40
Washington	3	120	0	39,124	67	26,189	115,754	4.42
West Virginia ...	84	8,404	38	2,413,283	61	1,472,666	1,933,808	1.31
Wisconsin	1	120	0	29,207	59	17,216	75,000	4.36
Wyoming	1	74	0	54,976	43.7	24,007	72,021	3.00
Total	336	47,668	575	20,907,319	63.5	13,288,964	22,102,514	1.663

a Semet-Solvay ovens.

b Includes coal used, coke produced, and its value in Utah.

c Includes 36 gas retorts.

d Production included with Pennsylvania.

e Includes coal used, coke produced, and its value in New York.

f Production included with Colorado.

Manufacture of coke in the United States, by States and Territories, in 1896.

State or Territory.	Estab- lish- ments.	Ovens.		Coal used.	Yield of coal in coke.	Coke pro- duced.	Total value of coke.	Value of coke per ton.
		Built.	Build- ing.					
				<i>Short tons.</i>	<i>Per ct.</i>	<i>Short tons.</i>		
Alabama	24	5,363	0	2,573,713	57.5	1,479,437	\$3,064,960	\$2.07
Colorado (a)	11	b 1,275	0	639,238	56.9	363,760	1,046,306	2.88
Georgia	1	334	0	109,655	49	53,673	68,486	1.276
Illinois	3	127	0	3,900	66.7	2,600	5,200	2.00
Indiana	2	94	0	8,956	49	4,353	8,647	1.99
Indian Territory ..	2	130	0	53,028	40	21,021	73,574	3.50
Kansas	6	55	0	8,940	53.5	4,785	8,676	1.813
Kentucky	4	264	0	55,719	48.6	27,107	42,062	1.55
Missouri	3	7	0	4,471	55.9	2,500	4,131	1.65
Montana	3	303	0	113,165	53	60,078	425,483	7.08
New Mexico	1	50	0	39,286	61.7	24,228	48,453	2.00
New York (c)	1	25	0					
Ohio	9	431	0	128,923	62.7	80,868	208,789	2.58
Pennsylvania (d) ..	158	26,658	154	11,124,610	66.1	7,356,502	13,182,859	1.792
Tennessee	15	1,861	100	600,379	56.5	339,202	624,011	1.84
Texas	1	60	0	0	0	0	0	0
Utah (e)	1	104	0					
Virginia	7	1,138	101	454,964	58.9	268,081	404,573	1.509
Washington	3	120	0	38,685	67	25,949	104,894	4.04
West Virginia	84	8,351	28	2,687,104	61.4	1,649,755	2,259,999	1.37
Wisconsin	1	120	0	8,648	62	5,332	21,000	3.94
Wyoming	1	74	0	41,038	47.6	19,542	58,626	3.00
Total	341	46,944	383	18,694,422	63	11,788,773	21,660,729	1.837

a Includes coal used, coke produced, and its value in Utah.

b Includes 36 gas retorts.

c Production included with Pennsylvania.

d Includes coal used, coke produced, and its value in New York.

e Production included with Colorado.

The increases and decreases in the several States during 1898, as compared with 1897, are shown in the following table:

Increases and decreases in coke production, by States, in 1898 as compared with 1897.

State or Territory.	Increase.		Decrease.	
	Amount of increase.	Per cent of increase.	Amount of decrease.	Per cent of decrease.
	<i>Short tons.</i>		<i>Short tons.</i>	
Alabama	220,003	15.25		
Colorado (a)	132,155	38.57		
Georgia	16,529	50.09		
Illinois	776	50.10		
Indiana			1,079	37.16
Indian Territory	3,746	12.34		
Kansas			2,001	32.37
Kentucky			9,875	30.75
Missouri			1,853	71.46
Montana			15,840	23.35
New Mexico	5,542	385.40		
Ohio			9,552	10.05
Pennsylvania and New York..	1,748,378	19.50		
Tennessee	25,776	6.99		
Texas			394	100.00
Virginia	177,094	50.02		
Washington	4,008	15.30		
West Virginia	452,405	30.72		
Wisconsin	18,064	104.93		
Wyoming			5,657	23.56
Total	2,758,225	20.756		

^aIncluding Utah.

The foregoing statement shows that the net increase in 1898 was 2,758,225 tons. The increases in the six leading States, Pennsylvania, West Virginia, Alabama, Virginia, Colorado, and Tennessee aggregated 2,755,811 tons. Six of the minor producing States increased their production by a total of 48,665 tons. Eight States had a decreased output, the total of which was 46,251 tons. In these figures the production of Utah and New York are included with Colorado and Pennsylvania respectively. Coke was made in 21 States.

In the following table are consolidated the statistics of the manufacture of coke in the United States from 1880 to 1898, inclusive:

Statistics of the manufacture of coke in the United States, 1880 to 1898, inclusive.

Year.	Estab-lish-ments.	Ovens.		Coal used.	Coke pro-duced.	Total value of coke at ovens.	Value of coke at ovens per ton.	Yield of coal in coke.
		Built.	Build-ing.					
				<i>Short tons.</i>	<i>Short tons.</i>			<i>Per ct.</i>
1880..	186	12, 372	1, 159	5, 237, 741	3, 338, 300	\$6, 631, 267	\$1.99	63
1881..	197	14, 119	1, 006	6, 546, 662	4, 113, 760	7, 725, 175	1.88	63
1882..	215	16, 356	712	7, 577, 648	4, 793, 321	8, 462, 167	1.77	63
1883..	231	18, 304	407	8, 516, 670	5, 464, 721	8, 121, 607	1.49	64
1884..	250	19, 557	812	7, 951, 974	4, 873, 805	7, 242, 878	1.49	61
1885..	233	20, 116	432	8, 071, 126	5, 106, 696	7, 629, 118	1.49	63
1886..	222	22, 597	4, 154	10, 688, 972	6, 845, 369	11, 153, 366	1.63	64
1887..	270	26, 001	3, 584	11, 859, 752	7, 611, 705	15, 321, 116	2.01	64
1888..	261	30, 059	2, 587	12, 945, 350	8, 540, 030	12, 445, 963	1.46	66
1889..	252	34, 165	2, 115	15, 960, 973	10, 258, 022	16, 630, 301	1.62	64
1890..	253	37, 158	1, 547	18, 005, 209	11, 508, 021	23, 215, 302	2.02	64
1891..	243	40, 245	911	16, 344, 540	10, 352, 688	20, 323, 216	1.97	63
1892..	261	42, 002	1, 893	18, 813, 337	12, 010, 829	23, 536, 141	1.96	64
1893..	258	44, 201	717	14, 917, 146	9, 477, 580	16, 523, 714	1.74	63.5
1894..	260	44, 772	591	^a 14, 348, 750	9, 203, 632	^a 12, 328, 856	1.34	64
1895..	265	45, 565	638	20, 848, 323	13, 333, 714	^b 19, 234, 319	1.44	64
1896..	341	46, 944	383	18, 694, 422	11, 788, 773	21, 660, 729	1.837	63
1897..	336	47, 668	575	20, 907, 319	13, 288, 984	22, 102, 514	1.663	63.5
1898..	342	48, 447	1, 048	25, 249, 570	16, 047, 209	25, 586, 699	1.594	63.6

^a Excluding New York.

^b Excluding New York and Texas.

TOTAL NUMBER OF COKE WORKS IN THE UNITED STATES.

The following table gives the number of establishments manufacturing coke in the United States at the close of each year from 1880 to 1898, by States. According to this table the number of establishments in the last three years has largely increased. The increase is only apparent. Prior to 1896 it was customary to include under one establishment all coke works reported from one general office, and to consider them separate establishments when reported individually from the central office. In the statistics for 1896, 1897, and 1898 the word "establishment" is used to designate the number of banks or batteries of ovens which were in operation, whether reported from one office or not. When one company reported production at two or more banks of ovens, each is considered a separate establishment.

COKE.

517

Number of establishments in the United States manufacturing coke on December 31 of each year from 1880 to 1898.

State or Territory.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.
Alabama	4	4	5	6	8	11	14	15	18	19
Colorado	1	2	5	7	8	7	7	7	7	9
Georgia	1	1	1	1	1	2	2	2	1	1
Illinois	6	6	7	7	9	9	9	8	8	4
Indiana	2	2	2	2	2	2	4	4	3	4
Indian Territory ..	1	1	1	1	1	1	1	1	1	1
Kansas	2	3	3	4	4	4	4	4	6	6
Kentucky	5	5	5	5	5	5	6	6	10	9
Missouri	0	0	0	0	0	0	0	1	1	3
Montana	0	0	0	1	3	2	4	2	1	2
New Mexico	0	0	2	2	2	2	2	1	1	2
Ohio	15	15	16	18	19	13	15	15	15	13
Pennsylvania	124	132	137	140	145	133	108	151	120	109
Tennessee	6	6	8	11	13	12	12	11	11	12
Texas	0	0	0	0	0	0	1	0	0	0
Utah	1	1	1	1	1	1	1	0	0	1
Virginia	0	0	0	1	1	1	2	2	2	2
Washington	0	0	0	0	1	1	1	1	3	1
West Virginia	18	19	22	24	27	27	29	39	52	53
Wisconsin	0	0	0	0	0	0	0	0	1	1
Wyoming	0	0	0	0	0	0	0	0	0	1
Total	186	197	215	231	250	233	222	270	261	253

State or Territory.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.
Alabama	20	21	20	23	22	22	24	25	25
Colorado	8	7	9	8	8	9	11	12	12
Georgia	1	1	1	1	1	1	1	1	2
Illinois	4	1	1	1	1	3	3	2	2
Indiana	4	2	2	2	2	2	2	2	2
Indian Territory ..	1	1	1	1	1	1	2	2	2
Kansas	7	6	6	6	6	5	6	4	6
Kentucky	9	7	5	4	6	5	4	5	5
Massachusetts	0	0	0	0	0	0	0	0	1
Missouri	3	3	3	3	3	3	3	3	3
Montana	2	2	2	2	2	3	3	3	4
New Mexico	2	1	1	1	1	1	1	2	3
New York	0	0	0	1	1	1	1	1	1
Ohio	13	9	10	9	8	8	9	9	10
Pennsylvania	106	109	109	102	101	99	158	153	151
Tennessee	11	11	11	11	11	12	15	15	15

Number of establishments in the United States manufacturing coke on December 31 of each year from 1880 to 1898—Continued.

State or Territory.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.
Texas	0	0	0	0	0	1	1	1	0
Utah	1	1	1	1	1	1	1	1	1
Virginia	2	2	2	2	2	5	7	6	6
Washington	5	2	3	3	3	3	3	3	2
West Virginia	55	55	72	75	78	78	84	84	87
Wisconsin	1	1	1	1	1	1	1	1	1
Wyoming	1	1	1	1	1	1	1	1	1
Total	253	243	261	258	260	265	341	336	342

The number of establishments in the country for each year since 1850 for which there are any returns is as follows:

Number of coke establishments in the United States since 1850.

Year.	Number.	Year.	Number.
1850 (census year)	4	1888, December 31	261
1860 (census year)	21	1889, December 31	253
1870 (census year)	25	1890, December 31	253
1880 (census year)	149	1891, December 31	243
1880, December 31	186	1892, December 31	261
1881, December 31	197	1893, December 31	258
1882, December 31	215	1894, December 31	260
1883, December 31	231	1895, December 31	265
1884, December 31	250	1896, December 31	341
1885, December 31	233	1897, December 31	336
1886, December 31	222	1898, December 31	342
1887, December 31	270		

As previously stated, the "number of establishments" in the last three years refers to the number of banks or batteries of ovens from which reports were received. Previously it was used to designate the number of firms or corporations engaged in coke making. The number of firms engaged in the industry in 1898 was 284, an increase in fifteen years of only a little more than 20 per cent, whereas, as shown in the next table, the number of coke ovens has increased 140 per cent. In the same period the coke product has increased over 200 per cent, illustrating very clearly the tendency of carrying on large industrial enterprises under one management rather than to distribute the business among a larger number of smaller concerns. In 1883 the average number of ovens to each firm or corporation was 79, and the

average yearly production by each firm about 23,600 tons. In 1898 the average number of ovens to a firm was 171, and the average production per firm 56,500 tons, showing that while the number of firms has increased only about 20 per cent in fifteen years, the average number of ovens to each has increased 120 per cent, and the average production per firm 140 per cent.

Of the 284 firms and corporations from whom reports were received in 1898, 53 produced no coke. The total number of ovens owned by these 53 firms was 2,686, an average of 50 ovens each. One of these firms owned 200 ovens, and 11 others owned between 100 and 150 each. From this it is seen that only one of the idle firms owned as many as the average number of ovens to a firm in 1898, and it appears that nearly all of the idle concerns were small producers. In addition to these there were 428 ovens idle, which were portions of plants that produced coke in 1898. All of these latter were in Pennsylvania. The total number of ovens idle in 1898 was 3,114, which deducted from the whole number of 48,447, leaves 45,333 ovens in active operation during the year. These distributed among the 231 active firms made an average of 196 ovens to each, as against an average of 50 for the idle ones.

NUMBER OF COKE OVENS IN THE UNITED STATES.

In the following table is presented a statement showing the number of ovens in existence in each State and Territory on December 31 of each year since 1880. In the earlier years covered by this table, some coke was made in pits and on the ground, but in later years little, if any, coke has been made except in ovens. Even when testing the adaptability of certain coals for coke making, it has been found advisable to ship the coals, frequently considerable distances, to where the experiments were to be made in ovens, beehive and by-product, so that a better judgment may be formed as to the proper kind of oven to be constructed.

The last three years have seen a noticeable increase in the number of by-product ovens built in the United States. In 1896 there were 160 by-product ovens in operation, exclusive of 30 Newton-Chambers ovens at Latrobe, Pa., and 3 Slocum ovens at Bolivar, which have not been operated as by-product ovens. At the close of 1897 there were 280 by-product ovens in operation, and in December, 1898, there were 520 in existence and 500 more under construction.

Number of coke ovens in the United States on December 31 of each year from 1880 to 1898.

State or Territory.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.
Alabama	316	416	536	767	976	1,075	1,301	1,555	2,475	3,944
Colorado	200	267	344	352	409	434	483	532	602	834
Georgia	140	180	220	264	300	300	300	300	290	900
Illinois	176	176	304	316	325	320	335	278	221	149
Indiana	45	45	37	37	37	37	100	119	103	111
Indian Ter	20	20	20	20	20	40	40	80	80	78
Kansas	6	15	20	23	23	23	36	39	58	68
Kentucky	45	45	45	45	45	33	76	98	132	166
Missouri	0	0	0	0	0	0	0	4	4	9
Montana	0	0	0	2	5	2	16	27	40	90
New Mexico....	0	0	0	12	70	70	70	70	70	70
New York	0	0	0	0	0	0	0	0	0	0
Ohio	616	641	647	682	732	642	560	585	547	462
Pennsylvania .	9,501	10,881	12,424	13,610	14,285	14,553	16,314	18,294	20,381	22,143
Tennessee	656	724	861	992	1,105	1,387	1,485	1,560	1,634	1,639
Texas	0	0	0	0	0	0	0	0	0	0
Utah	20	20	20	20	20	20	20	0	0	34
Virginia	0	0	0	200	200	200	350	350	550	550
Washington....	0	0	0	0	0	2	11	30	30	30
West Virginia..	631	689	878	962	1,005	978	1,100	2,080	2,792	3,438
Wisconsin	0	0	0	0	0	0	0	0	50	50
Wyoming	0	0	0	0	0	0	0	0	0	0
Total.....	12,372	14,119	16,356	18,304	19,557	20,116	22,597	26,001	30,059	34,165

State or Territory.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.
Alabama	4,805	5,068	5,320	5,548	5,551	5,658	5,363	5,365	a 5,456
Colorado	916	948	b 1,128	b 1,154	b 1,154	b 1,169	b 1,275	b 1,273	b 1,253
Georgia	300	300	300	338	338	330	334	300	350
Illinois	148	25	24	24	24	129	127	126	126
Indiana	101	84	84	94	94	94	94	94	94
Indian Ter	78	80	80	80	80	80	130	130	130
Kansas	68	72	75	75	61	55	55	57	47
Kentucky	175	115	287	283	293	293	264	268	292
Missouri	10	10	10	10	10	10	7	15	8
Montana	140	140	153	153	153	303	303	303	318
New Mexico....	70	c 0	50	50	50	50	50	126	190
New York	0	0	0	d 12	d 12	d 12	d 25	d 25	d 25
Ohio	443	421	436	435	363	377	431	433	441

a Includes 120 Somet-Solvay ovens.
c Coke was made in pits.

b Includes 36 gas retorts.
d Somet-Solvay ovens.

Number of coke ovens in the United States on December 31 of each year from 1880 to 1898—Continued.

State or Territory.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.
Pennsylvania	23,430	25,324	25,366	25,744	25,824	a26,042	a26,658	b26,910	c27,157
Tennessee	1,664	1,995	1,941	1,942	1,860	1,903	1,861	1,948	1,949
Texas	0	0	0	0	0	6	60	20	0
Utah	80	80	83	83	83	84	104	104	104
Virginia	550	550	594	594	736	832	1,138	1,453	d1,564
Washington	30	80	84	84	84	110	120	120	90
West Virginia	4,060	4,621	5,843	7,354	7,858	7,834	8,351	8,404	e8,659
Wisconsin	70	120	120	120	120	120	120	120	120
Wyoming	20	24	24	24	24	74	74	74	74
Total	37,158	40,057	42,002	44,201	44,772	45,565	46,944	47,668	48,447

a Includes 60 Otto-Hoffmann ovens, 75 Semet-Solvay ovens, 30 Newton-Chambers ovens, and 3 Slocum ovens.

b Includes 180 Otto-Hoffmann ovens, 75 Semet-Solvay ovens, 30 Newton-Chambers ovens, and 3 Slocum ovens.

c Includes 180 Otto-Hoffmann ovens, 75 Semet-Solvay ovens, and 30 Newton-Chambers ovens.

d Includes 60 Newton-Chambers ovens.

e Includes 60 Semet-Solvay ovens.

It will seem from the above table that the total number of ovens in the United States in 1898 was 48,447 as against 47,668 in 1897, an increase of 779 ovens, of which increase 240 ovens were of the by-product types. The largest increase was in West Virginia, where the number increased from 8,404 to 8,659, a gain of 255, of which 60 were Semet-Solvay by-product ovens. The next largest increase was in Pennsylvania, 250 beehive ovens being added and 3 Slocum ovens abandoned, a net gain of 247. Virginia came next with an increase of 111 from 1,453 in 1897 to 1,564 in 1898. Sixty of the new ovens were of the Newton-Chambers by-product type. Alabama added 120 Semet-Solvay ovens in 1898 and abandoned 29 old ones of the beehive pattern, making a net increase of 91. Colorado added 80 beehive ovens. By this it will be seen that five of the six States leading in production led also in new development.

Of the total number of ovens given in the foregoing table 3,114 were not operated in 1898. The idle ovens were distributed as follows: Pennsylvania, 1,531, or 5.6 per cent; West Virginia, 568, or 6.6 per cent; Alabama, 286, or 5½ per cent; Ohio, 190, or 43 per cent; Kentucky, 150, or 51 per cent; Tennessee, 128, or 6.6 per cent; New Mexico, 76, or 40 per cent; Montana, 100, or 31 per cent; Indiana, 40, or 43 per cent; Colorado, 30, or 2.4 per cent; Kansas, 9; Virginia, 4, and Missouri, 2.

NUMBER OF COKE OVENS BUILDING IN THE UNITED STATES.

The number of coke ovens in course of construction on December 31, 1898, was 1,048, of which 500, or practically 50 per cent, were of the Otto-Hoffmann by-product type. There were eight States in which new ovens were building at the close of the year, and of these eight five were of the six leading producers. Virginia was the only one of the six leading States which had no new ovens building at the close of the year.

Number of coke ovens building in the United States at the close of each year from 1880 to 1898.

State or Territory.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.
Alabama	100	120	0	122	242	16	1,012	1,362	406	427
Colorado	50	0	0	0	24	0	0	0	100	50
Georgia	40	40	44	36	0	0	0	0	0	0
Illinois	0	0	0	0	0	0	0	0	0	0
Indiana	0	0	0	0	0	0	18	0	0	0
Indian Territory ..	0	0	0	0	0	0	0	0	0	0
Kansas	0	0	0	0	0	0	0	0	0	0
Kentucky	0	0	0	0	0	0	2	0	2	100
Missouri	0	0	0	0	0	0	0	0	0	0
Montana	0	0	0	0	12	0	0	0	0	50
New Mexico	0	0	12	28	0	0	0	0	0	0
New York	0	0	0	0	0	0	0	0	0	0
Ohio	25	0	0	0	0	0	0	223	12	0
Pennsylvania	836	761	642	211	232	317	2,558	802	1,565	567
Tennessee	68	84	14	10	175	36	126	165	84	40
Texas	0	0	0	0	0	0	0	0	0	0
Virginia	0	0	0	0	0	0	100	300	0	250
Washington	0	0	0	0	0	0	21	0	100	0
West Virginia	40	0	0	0	127	63	317	742	318	631
Wisconsin	0	0	0	0	0	0	0	0	0	0
Wyoming	0	0	0	0	0	0	0	0	0	0
Total	1,159	1,005	712	407	812	432	4,154	3,594	2,587	2,115

State or Territory.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.
Alabama	371	50	90	60	50	50	0	a 120	100
Colorado	30	21	220	200	250	0	0	0	3
Georgia	0	0	0	0	0	0	0	0	0
Illinois	0	0	0	0	0	0	0	0	0
Indiana	0	0	0	0	0	0	0	0	0
Indian Territory ..	0	0	0	0	0	0	0	0	0

a Semet-Solvay.

Number of coke ovens building in the United States at the close of each year from 1880 to 1898—Continued.

State or Territory.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.
Kansas.....	0	0	0	0	0	0	0	0	50
Kentucky.....	303	24	100	100	0	0	0	0	2
Massachusetts.....	0	0	0	0	0	0	0	0	^a 400
Missouri.....	0	0	0	0	0	0	0	0	0
Montana.....	0	0	0	0	0	0	0	0	0
New Mexico.....	0	0	0	0	0	0	0	0	0
New York.....	0	0	0	0	^b 13	^b 13	0	0	0
Ohio.....	1	0	0	0	0	0	0	0	0
Pennsylvania.....	74	11	269	19	118	^c 170	^d 154	307	^e 292
Tennessee.....	292	0	0	0	0	0	100	0	40
Texas.....	0	0	0	0	0	0	0	0	0
Virginia.....	250	250	206	206	100	350	101	110	0
Washington.....	80	0	30	0	0	0	0	0	0
West Virginia.....	334	555	978	132	60	55	28	38	161
Wisconsin.....	0	0	0	0	0	0	0	0	0
Wyoming.....	0	0	0	0	0	0	0	0	0
Total.....	1,735	911	1,893	717	591	638	383	575	1,048

^a Otto-Hoffmann ovens.

^b Semet-Solvay ovens.

^c Includes 60 Otto-Hoffmann and 50 Semet-Solvay ovens.

^d Includes 120 Otto-Hoffmann ovens.

^e Includes 100 Otto-Hoffmann ovens.

PRODUCTION OF COKE SINCE 1880, BY STATES.

In the following table is presented a statement of the amount of coke produced in each State and Territory during the last nineteen years:

Amount of coke produced, in short tons, in the United States from 1880 to 1898, inclusive, by States and Territories.

State or Territory.	1880.	1881.	1882.	1883.	1884.
Alabama.....	60,781	109,033	152,940	217,531	244,009
Colorado.....	25,568	48,587	102,105	133,997	115,719
Georgia.....	38,041	41,376	46,602	67,012	79,268
Illinois.....	12,700	14,800	11,400	13,400	13,095
Indiana.....	0	0	0	0	0
Indian Territory	1,546	1,768	2,025	2,573	1,912
Kansas.....	3,070	5,670	6,080	8,430	7,190
Kentucky.....	4,250	4,370	4,070	5,025	2,223
Missouri.....	0	0	0	0	0
Montana.....	0	0	0	0	75

Amount of coke produced, in short tons, in the United States from 1880 to 1898, inclusive, by States and Territories—Continued.

State or Territory.	1880.	1881.	1882.	1883.	1884.
New Mexico....	0	0	1,000	3,905	18,282
New York	0	0	0	0	0
Ohio	100,596	119,469	103,722	87,834	62,709
Pennsylvania ..	2,821,384	3,437,708	3,945,034	4,438,464	3,822,128
Tennessee	130,609	143,853	187,695	203,691	219,723
Texas	0	0	0	0	0
Utah	1,000	0	250	0	0
Virginia	0	0	0	25,840	63,600
Washington	0	0	0	.....	400
West Virginia..	138,755	187,126	230,398	257,519	223,472
Wisconsin	0	0	0	0	0
Wyoming	0	0	0	0	0
Total	3,338,300	4,113,760	4,793,321	5,464,721	4,873,805

State or Territory.	1885.	1886.	1887.	1888.	1889.
Alabama	301,180	375,054	325,020	508,511	1,030,510
Colorado	131,960	142,797	170,698	179,682	187,638
Georgia	70,669	82,680	79,241	83,721	94,727
Illinois	10,350	8,103	9,198	7,410	11,583
Indiana	0	6,124	17,658	11,956	8,301
Indian Territory	3,584	6,351	10,060	7,502	6,639
Kansas	8,050	12,493	14,950	14,831	13,910
Kentucky	2,704	4,528	14,565	23,150	13,021
Missouri	0	0	2,970	2,600	5,275
Montana	175	0	7,200	12,000	14,043
New Mexico....	17,940	10,236	13,710	8,540	3,460
New York	0	0	0	0	0
Ohio	39,416	34,932	93,004	67,194	75,124
Pennsylvania ..	3,991,805	5,406,597	5,832,849	6,545,779	7,659,055
Tennessee	218,842	368,139	396,979	385,693	359,710
Texas	0	0	0	0	0
Utah	0	0	0	0	761
Virginia	49,139	122,352	166,947	149,199	146,528
Washington	311	825	14,625	0	3,841
West Virginia..	260,571	264,158	442,031	531,762	607,880
Wisconsin	0	0	0	500	16,016
Wyoming	0	0	0	0	0
Total	5,106,696	6,845,369	7,611,705	8,540,030	10,258,022

Amount of coke produced, in short tons, in the United States from 1880 to 1898, inclusive, by States and Territories—Continued.

State or Territory.	1890.	1891.	1892.	1893.	1894.
Alabama	1,072,942	1,282,496	1,501,571	1,168,085	923,817
Colorado	245,756	277,074	365,920	346,981	301,140
Georgia	102,233	103,057	81,807	90,726	92,029
Illinois	5,000	5,200	3,170	2,200	2,200
Indiana	6,013	3,798	2,207	5,724	6,551
Indian Territory	6,639	9,464	3,569	7,135	3,051
Kansas	12,311	14,174	9,132	8,565	8,439
Kentucky	12,343	33,777	36,123	48,619	29,748
Missouri	6,136	6,872	7,299	5,905	2,250
Montana	14,427	29,009	34,557	29,945	17,388
New Mexico	2,050	2,300	0	5,803	6,529
New York	0	0	0	12,850	16,500
Ohio	74,633	38,718	51,818	22,436	32,640
Pennsylvania	8,560,245	6,954,846	8,327,612	6,229,051	6,063,777
Tennessee	348,728	364,318	354,096	265,777	292,646
Texas	0	0	0	0	0
Utah	8,528	7,949	7,309	16,005	16,056
Virginia	165,847	167,516	147,912	125,092	180,091
Washington	5,837	6,000	7,177	6,731	5,245
West Virginia	833,377	1,009,051	1,034,750	1,062,076	1,193,933
Wisconsin	24,976	34,387	33,800	14,958	4,250
Wyoming	0	2,682	0	2,916	4,352
Total	11,508,021	10,352,688	12,010,829	9,477,580	9,203,632

State or Territory.	1895.	1896.	1897.	1898.
Alabama	1,444,339	1,479,437	1,443,017	1,663,020
Colorado	317,838	343,313	319,036	445,982
Georgia	60,212	53,673	33,000	49,529
Illinois	2,250	2,600	1,549	2,325
Indiana	4,804	4,353	2,904	1,825
Indian Territory	5,175	21,021	30,364	34,110
Kansas	5,287	4,785	6,181	4,180
Kentucky	25,460	27,107	32,117	22,242
Missouri	2,028	2,500	2,593	740
Montana	25,337	60,078	67,849	52,009
New Mexico	14,663	24,228	1,438	6,980
New York	18,521	(a)	(a)	(a)
Ohio	29,050	80,868	95,087	85,535
Pennsylvania	9,404,215	b 7,356,502	b 8,966,924	b 10,715,302
Tennessee	396,790	339,202	368,769	394,545
Texas	286	0	394	0
Utah	22,519	20,447	23,617	28,826
Virginia	244,738	268,081	354,067	531,161
Washington	15,129	25,949	26,139	30,197
West Virginia	1,285,206	1,649,755	1,472,666	1,925,071
Wisconsin	4,972	5,332	17,216	35,280
Wyoming	4,895	19,542	24,007	18,350
Total	13,333,714	11,788,773	13,288,984	16,047,209

a Included with Pennsylvania.

b Includes production of New York.

VALUE AND AVERAGE SELLING PRICE OF COKE.

In the following table is given the total value of coke produced in the United States in each year from 1880 to 1898, inclusive:

Total value at the ovens of the coke made in the United States from 1880 to 1898, inclusive, by States and Territories.

State or Territory.	1880.	1881.	1882.	1883.	1884.
Alabama	\$183,063	\$326,819	\$425,940	\$596,473	\$609,185
Colorado	145,226	267,156	476,665	584,578	409,930
Georgia	81,789	88,753	100,194	147,166	169,192
Illinois	41,950	45,850	29,050	28,200	25,639
Indiana	0	0	0	0	0
Indian Territory	4,638	5,304	6,075	7,719	5,736
Kansas	6,000	10,200	11,460	16,560	14,580
Kentucky	12,250	12,630	11,530	14,425	8,760
Missouri	0	0	0	0	0
Montana	0	0	0	0	900
New Mexico	0	0	6,000	21,478	91,410
New York	0	0	0	0	0
Ohio	255,905	297,728	266,113	225,660	156,294
Pennsylvania ..	5,255,040	5,898,579	6,133,698	5,410,387	4,783,230
Tennessee	318,607	342,585	472,505	459,126	428,870
Utah	10,000	0	2,500	0	0
Virginia	0	0	0	44,345	111,300
Washington	0	0	0	0	1,900
West Virginia ..	318,797	429,571	520,437	563,490	425,952
Wisconsin	0	0	0	0	0
Wyoming	0	0	0	0	0
Total	6,631,265	7,725,175	8,462,167	8,121,607	7,242,878

State or Territory.	1885.	1886.	1887.	1888.	1889.
Alabama	\$755,645	\$993,302	\$775,090	\$1,189,679	\$2,372,417
Colorado	512,162	569,120	682,778	716,305	643,479
Georgia	144,198	179,031	174,410	177,907	149,069
Illinois	27,798	21,487	19,594	21,038	29,764
Indiana	0	17,953	51,141	31,993	25,922
Indian Territory	12,902	22,229	33,435	21,755	17,957
Kansas	13,255	19,204	28,575	29,073	26,593
Kentucky	8,499	10,082	31,730	47,244	29,769
Missouri	0	0	10,395	9,100	5,800
Montana	2,063	0	72,000	96,000	122,023
New Mexico	89,700	51,180	82,260	51,240	18,408
New York	0	0	0	0	0

COKE.

527

Total value at the ovens of the coke made in the United States from 1880 to 1898, inclusive, by States and Territories—Continued.

State or Territory.	1885.	1886.	1887.	1888.	1889.
Ohio	\$109,723	\$94,042	\$245,981	\$166,330	\$188,222
Pennsylvania ..	4,981,656	7,664,023	10,746,352	8,230,759	10,743,492
Tennessee	398,459	687,865	870,900	490,491	731,496
Utah	0	0	0	0	3,042
Virginia	85,993	305,880	417,368	260,000	325,861
Washington	1,477	4,125	102,375	0	30,728
West Virginia..	485,588	513,843	976,732	905,549	1,074,177
Wisconsin	0	0	0	1,500	92,092
Wyoming	0	0	0	0	0
Total	7,629,118	11,153,366	15,321,116	12,445,963	16,630,301

State or Territory.	1890.	1891.	1892.	1893.	1894.
Alabama	\$2,589,447	\$2,986,242	\$3,464,623	\$2,648,632	\$1,871,348
Colorado	959,246	896,984	^a 1,234,320	^a 1,137,488	^a 903,970
Georgia	150,995	231,878	163,614	136,089	116,286
Illinois	11,250	11,700	7,133	4,400	4,400
Indiana	19,706	7,596	6,472	9,048	13,102
Indian Territory	21,577	30,483	12,402	25,072	10,693
Kansas	29,116	33,296	19,906	18,640	15,660
Kentucky	22,191	68,281	72,563	97,350	51,566
Missouri	9,240	10,000	10,949	9,735	3,563
Montana	125,655	258,523	311,013	239,560	165,187
New Mexico	10,025	10,925	0	18,476	28,213
New York	0	0	0	35,925	.....
Ohio	218,090	76,901	112,907	43,671	90,875
Pennsylvania ..	16,333,674	12,679,826	15,015,336	9,468,036	6,585,489
Tennessee	684,116	701,803	724,106	491,523	480,124
Utah	37,196	35,778	(b)	(b)	(b)
Virginia	278,724	265,107	322,486	282,898	295,747
Washington	46,696	42,000	50,446	34,207	18,249
West Virginia..	1,524,746	1,845,043	1,821,965	1,716,907	1,639,687
Wisconsin	143,612	192,804	185,900	95,851	19,465
Wyoming	0	8,046	0	10,206	15,232
Total	23,215,302	20,393,216	23,536,141	16,523,714	12,328,856

^a Includes value of Utah coke.

^b Included with Colorado.

Total value at the ovens of the coke made in the United States from 1880 to 1898, inclusive, by States and Territories—Continued.

State or Territory.	1895.	1896.	1897.	1898.
Alabama.....	\$3,033,521	\$3,064,960	\$3,094,461	\$3,378,946
Colorado.....	<i>a</i> 940,987	<i>a</i> 1,046,306	<i>a</i> 999,216	<i>a</i> 1,230,428
Georgia.....	70,580	68,486	42,240	77,230
Illinois.....	4,500	5,200	2,895	4,686
Indiana.....	9,333	8,647	5,795	3,194
Indian Territory.....	17,657	73,574	104,725	96,639
Kansas.....	11,289	8,676	9,272	6,455
Kentucky.....	37,249	42,062	45,454	32,213
Missouri.....	2,442	4,131	3,890	1,050
Montana.....	189,856	425,483	467,481	359,174
New Mexico.....	29,491	48,453	3,232	14,625
New York.....	.....	(<i>b</i>)	(<i>b</i>)	(<i>b</i>)
Ohio.....	69,655	208,789	235,784	211,558
Pennsylvania.....	11,908,162	<i>c</i> 13,182,859	<i>c</i> 13,727,966	<i>c</i> 16,078,505
Tennessee.....	754,926	624,011	667,656	642,920
Utah.....	(<i>d</i>)	(<i>d</i>)	(<i>d</i>)	(<i>d</i>)
Virginia.....	322,564	404,573	495,864	699,781
Washington.....	64,632	104,894	115,754	128,933
West Virginia.....	1,724,239	2,259,999	1,933,808	2,432,637
Wisconsin.....	26,103	21,000	75,000	123,480
Wyoming.....	17,133	58,626	72,021	64,225
Total.....	19,234,319	21,660,729	22,102,514	25,586,699

a Includes value of Utah coke.
b Included with Pennsylvania.

c Includes value of New York coke.
d Included with Colorado.

While this table gives the totals of the value as returned in the schedules, the figures do not always represent the same thing. A statement as to the actual selling price of the coke was asked for, and in most cases, including possibly 80 per cent of all the coke produced, the figures are the actual selling price. In some cases, however, the value is an estimate. Considerable of the coke made in the United States is produced by proprietors of blast furnaces for consumption in their own furnaces, none being sold. The value, therefore, given for this coke would be an estimate, based, in some instances, where there are coke works in the neighborhood selling coke for the general market, upon the price obtained for this coke; in other cases the cost is estimated at the cost of the coke at the furnace plus a small percentage for profit on the coking operation, while in still other cases the value given is only the actual cost of the coke at the ovens.

In the following table is given the average value per short ton of the coke made in the United States for each year from 1880 to 1898, inclusive, by States and Territories:

Average value per short ton at the ovens of the coke made in the United States from 1880 to 1898, inclusive, by States and Territories.

State or Territory.	1880.	1881.	1882.	1883.	1884.	1885.	1886.
Alabama	\$3.01	\$3.00	\$2.79	\$2.75	\$2.50	\$2.50	\$2.65
Colorado	5.68	5.29	4.67	4.36	3.45	3.88	3.99
Georgia	2.15	2.15	2.15	2.20	2.13	2.04	2.17
Illinois	3.30	3.10	2.55	2.10	1.96	2.68	2.65
Indiana							2.93
Indian Territory	3.00	3.00	3.00	3.00	3.00	3.60	3.50
Kansas	1.95	1.80	1.70	1.96	2.02	1.65	1.54
Kentucky	2.88	2.89	2.83	2.87	3.94	3.14	2.23
Missouri							
Montana					12.00	11.72	
New Mexico			6.00	5.50	5.00	5.00	5.00
Ohio	2.54	2.49	2.57	2.57	2.49	2.78	2.69
Pennsylvania ..	1.86	1.70	1.55	1.22	1.25	1.25	1.42
Tennessee	2.42	2.33	2.52	2.25	1.95	1.31	1.87
Utah	10.00		10.00				
Virginia				1.75	1.75	1.75	2.50
Washington					4.75	4.75	5.00
West Virginia..	2.30	2.30	2.26	2.19	1.19	1.86	1.94
Wisconsin							
Average..	1.99	1.88	1.77	1.49	1.49	1.49	1.63

State or Territory.	1887.	1888.	1889.	1890.	1891.	1892.
Alabama	\$2.39	\$2.34	\$2.30	\$2.41	\$2.33	\$2.31
Colorado	4.00	4.00	3.43	3.90	3.24	3.31
Georgia	2.20	2.12	1.57	1.48	2.25	2.00
Illinois	2.13	2.84	2.57	2.25	2.25	2.25
Indiana	2.81	2.68	3.12	3.28	2.00	2.02
Indian Territory	3.33	2.90	2.70	3.25	3.22	3.47
Kansas	1.91	1.96	1.91	2.37	2.35	2.18
Kentucky	2.18	2.04	2.28	1.80	2.02	2.01
Missouri	3.50	3.50	1.10	1.51	1.46	1.50
Montana	10.00	8.00	8.69	8.71	8.91	9.00
New Mexico	6.00	6.00	5.32	4.89	4.75	
New York						
Ohio	2.65	2.48	2.50	2.92	1.99	2.18
Pennsylvania ..	1.84	1.26	1.40	1.91	1.82	1.80
Tennessee	2.19	1.27	2.03	1.96	1.93	2.05
Utah			4.00	4.36	4.50	
Virginia	2.50	1.74	2.22	1.68	1.58	2.18
Washington	7.00	0	8.00	8.00	7.00	7.03
West Virginia..	2.22	1.70	1.76	1.83	1.83	1.76
Wisconsin		3.00	5.75	5.75	5.61	5.50
Wyoming					3.00	
Average..	2.01	1.46	1.62	2.02	1.97	1.96

Average value per short ton at the ovens of the coke made in the United States from 1880 to 1898, inclusive by States and Territories—Continued.

State or Territory.	1893.	1894.	1895.	1896.	1897.	1898.
Alabama	\$2.27	\$2.025	\$2.10	\$2.07	\$2.14	\$2.03
Colorado	<i>a</i> 3.13	<i>a</i> 2.85	<i>a</i> 2.76	<i>a</i> 2.88	<i>a</i> 2.916	<i>a</i> 2.59
Georgia	1.50	1.25	1.17	1.276	1.28	1.56
Illinois	2.00	2.00	2.00	2.00	1.87	2.02
Indiana	1.58	2.00	1.94	1.99	1.995	1.75
Indian Territory	3.51	3.50	3.41	3.50	3.45	2.833
Kansas	2.18	1.855	2.14	1.813	1.50	1.544
Kentucky	2.00	1.73	1.46	1.55	1.41	1.448
Missouri	1.65	1.58	1.20	1.65	1.50	1.42
Montana	8.00	9.50	7.49	7.08	6.89	6.906
New Mexico....	3.18	4.32	2.01	2.00	2.25	2.095
New York	2.80					
Ohio	1.95	2.78	2.40	2.58	2.48	2.47
Pennsylvania ..	1.52	1.086	1.266	<i>b</i> 1.792	<i>b</i> 1.53	<i>b</i> 1.50
Tennessee	1.85	1.64	1.90	1.84	1.81	1.63
Utah						
Virginia	2.26	1.64	1.32	1.509	1.40	1.317
Washington....	5.08	3.48	4.27	4.04	4.42	4.27
West Virginia..	1.62	1.373	1.34	1.37	1.31	1.26
Wisconsin.....	6.41	4.58	5.25	3.94	4.36	3.50
Wyoming	3.50	3.50	3.50	3.00	3.00	3.50
Average..	1.74	1.34	1.44	1.837	1.663	1.594

a Average value, including Utah. *b* Average value, including New York.

The preceding table shows that the average price (obtained by dividing the total value by the total product) has declined from \$1.84 in 1896 to \$1.66 in 1897, and \$1.59 in 1898. The average price by States (obtained in the same manner) shows that the price declined in thirteen and advanced in six, and that all six of the leading producers were included in the thirteen States having a decline in price. And while it is true that in many cases the prices obtained at the works were less in 1898 than in 1897, the decline in value was not in reality what is shown on the face of the statistics. A considerable portion of the apparent decrease in value was due to increased production at ovens where favorable conditions obtain for making cheaper coke, whereas less favored competitors could not share in the increased activity. An increased production of cheaper coke in greater proportion than the higher priced product causes a decline in the average shown for the State or district, whereas the prices may have been slightly better for each operator. The fact that the average prices declined in each of the six leading States, and when the demand was active and fully up to the supply the greater part of the year, leads to the belief that those producing the cheapest coke captured most of the increased business.

RANK OF COKE-PRODUCING STATES.

The following table gives the relative rank of the States and Territories in the production of coke from 1880 to 1898, inclusive:

Rank of the States and Territories in production of coke from 1880 to 1898.

State or Territory.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.
Pennsylvania.....	1	1	1	1	1	1	1	1	1	1
West Virginia.....	2	2	2	2	3	3	4	2	2	3
Alabama.....	5	5	4	3	2	2	2	4	3	2
Colorado.....	7	6	6	5	5	5	5	5	5	5
Tennessee.....	3	3	3	4	4	4	3	3	4	4
Virginia.....				8	7	7	6	6	6	6
Ohio.....	4	4	5	6	8	8	8	7	8	8
Montana.....					15	15		16	12	10
Georgia.....	6	7	7	7	6	6	7	8	7	7
Kentucky.....	9	10	10	11	12	13	14	12	9	12
Washington.....					14	14	15	11	10	17
New Mexico.....			12	12	9	9	10	13	14	18
Indian Territory..	11	11	11	13	13	12	12	14	15	15
Utah.....	12		13							19
Wisconsin.....									18	9
Kansas.....	10	9	9	10	11	11	9	10	11	11
Indiana.....							13	9	13	14
Illinois.....	8	8	8	9	10	10	11	15	16	13
Missouri.....								17	17	16
Texas.....										

State or Territory.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.
Pennsylvania.....	1	1	1	1	1	1	1	1	1
West Virginia.....	3	3	3	3	2	3	2	2	2
Alabama.....	2	2	2	2	3	2	3	3	3
Virginia.....	6	6	6	6	6	6	6	5	4
Colorado.....	5	5	4	4	4	5	4	6	5
Tennessee.....	4	4	5	5	5	4	5	4	6
Ohio.....	8	8	8	10	8	8	7	7	7
Montana.....	10	11	10	9	10	10	8	8	8
Georgia.....	7	7	7	7	7	7	9	9	9
Wisconsin.....	9	9	11	12	18	17	17	16	10
Indian Territory..	14	13	16	15	19	16	13	11	11
Washington.....	17	16	15	16	16	13	11	13	12
Utah.....	13	14	13	11	12	11	14	15	13
New York.....				13	11	12	16	12	14
Kentucky.....	11	10	9	8	9	9	10	10	15
Wyoming.....		19		20	17	18	15	14	16
New Mexico.....	19	20		18	15	14	12	21	17
Kansas.....	12	12	12	14	13	15	18	17	18
Illinois.....	18	17	18	21	21	20	20	20	19
Indiana.....	16	18	17	19	14	19	19	18	20
Missouri.....	15	15	14	17	20	21	21	19	21
Texas.....						22	22	22	

The only change worthy of note which has been made in the standing of the coke-producing States by the statistics of 1898 is the dropping of Tennessee from fourth to sixth place in rank, advancing Virginia and Colorado a point apiece. Virginia took fourth place for the first time in its history, and Colorado fifth place for the eleventh time in nineteen years. West Virginia and Alabama appear to be as firmly located in second and third place, respectively, as Pennsylvania is in first place.

COAL CONSUMED IN THE MANUFACTURE OF COKE.

In the following table is given the total number of tons of coal used in the manufacture of coke in the United States for the years 1880 to 1898:

Amount of coal used in the manufacture of coke in the United States from 1880 to 1898, inclusive, by States and Territories.

[Short tons.]

State or Territory.	1880.	1881.	1882.	1883.	1884.
Alabama	106,283	184,881	261,839	359,699	413,184
Colorado	51,891	97,508	180,549	224,089	181,968
Georgia	63,402	68,960	77,670	111,687	132,113
Illinois	31,240	35,240	25,270	31,370	30,168
Indian Territory	2,494	2,852	3,266	4,150	3,084
Kansas	4,800	8,800	9,200	13,400	11,500
Kentucky	7,206	7,406	6,006	8,437	3,451
Montana					165
New Mexico			1,500	6,941	29,990
Ohio	172,453	201,145	181,577	152,502	108,164
Pennsylvania ..	4,347,558	5,393,503	6,149,179	6,823,275	6,204,604
Tennessee	217,656	241,644	313,537	330,961	348,295
Utah	2,000		500		
Virginia				39,000	99,000
Washington					700
West Virginia..	230,758	304,823	366,653	411,159	385,588
Total	5,237,741	6,546,762	7,577,646	8,516,670	7,951,974

State or Territory.	1885.	1886.	1887.	1888.	1889.
Alabama	507,934	635,120	550,047	858,608	1,746,277
Colorado	208,069	228,060	267,487	274,212	299,731
Georgia	117,781	136,133	158,482	140,000	157,878
Illinois	21,487	17,806	16,596	13,020	19,250
Indiana		13,080	35,600	26,547	16,428
Indian Territory	5,781	10,242	20,121	13,126	13,277
Kansas	15,000	23,062	27,604	24,934	21,600

Amount of coal used in the manufacture of coke in the United States, etc.—Continued.

[Short tons.]

State or Territory.	1885.	1886.	1887.	1888.	1889.
Kentucky	5,075	9,055	29,129	42,642	25,129
Missouri			5,400	5,000	8,485
Montana	300		10,800	20,000	30,576
New Mexico	31,889	18,194	22,549	14,628	7,162
Ohio	68,796	59,332	164,974	124,201	132,828
Pennsylvania ..	6,178,500	8,290,849	8,938,438	9,673,097	11,581,292
Tennessee	412,538	621,669	665,857	630,099	626,016
Utah					2,217
Virginia	81,899	200,018	235,841	230,529	238,793
Washington	544	1,400	22,500		6,983
West Virginia..	415,533	425,002	698,327	863,707	1,001,372
Wisconsin				1,000	25,616
Total	8,071,126	10,688,972	11,859,752	12,945,350	15,960,973

State or Territory.	1890.	1891.	1892.	1893.	1894.
Alabama	1,809,964	2,144,277	2,585,966	2,015,398	1,574,245
Colorado	407,023	452,749	a 599,200	a 628,935	a 542,429
Georgia	170,388	164,875	158,978	171,645	166,523
Illinois	9,000	10,000	4,800	3,300	3,800
Indiana	11,753	8,688	6,456	11,549	13,489
Indian Territory	13,278	20,551	7,138	15,118	7,274
Kansas	21,809	27,181	15,437	13,645	13,288
Kentucky	24,372	64,390	70,783	97,212	66,418
Missouri	9,491	10,377	11,088	8,875	3,442
Montana	32,148	61,667	64,412	61,770	33,313
New Mexico	3,980	4,000	0	14,698	13,042
New York				15,150	
Ohio	126,921	69,320	95,236	42,963	55,324
Pennsylvania ..	13,046,143	10,588,544	12,591,345	9,386,702	9,059,118
Tennessee	600,387	623,177	600,126	449,511	516,802
Utah	24,058	25,281			
Virginia	251,683	285,113	226,517	194,059	280,524
Washington	9,120	10,000	12,372	11,374	8,563
West Virginia..	1,395,266	1,716,976	1,709,183	1,745,757	1,976,128
Wisconsin	38,425	52,904	54,300	24,085	6,343
Wyoming		4,470	0	5,400	8,685
Total	18,005,209	16,344,540	18,813,337	14,917,146	14,348,750

a Includes coal consumed in Utah.

Amount of coal used in the manufacture of coke in the United States, etc.—Continued.

[Short tons.]

State or Territory.	1895.	1896.	1897.	1898.
Alabama	2,459,465	2,573,713	2,451,475	2,814,615
Colorado	^a 580,584	^a 639,238	^a 616,592	^a 803,686
Georgia	118,900	109,655	67,000	81,108
Illinois	3,600	3,900	3,591	6,650
Indiana	9,898	8,956	7,022	4,065
Indian Territory	11,825	53,028	68,495	73,330
Kansas	8,424	8,940	11,772	7,856
Kentucky	63,419	55,719	64,234	44,484
Missouri	3,120	4,471	4,627	1,500
Montana	55,770	113,165	139,907	92,552
New Mexico	22,385	39,286	2,585	12,557
New York	22,207	(b)	(b)	(b)
Ohio	51,921	128,923	151,545	134,757
Pennsylvania ..	14,211,567	^c 11,124,610	^c 13,538,646	^c 16,307,841
Tennessee	684,655	600,379	667,996	722,356
Texas	530	0	700	0
Utah		(d)	(d)	(d)
Virginia	410,737	454,964	574,542	852,972
Washington	22,973	38,685	39,124	48,559
West Virginia ..	2,087,816	2,687,104	2,413,283	3,145,398
Wisconsin	8,287	8,648	29,207	59,900
Wyoming	10,240	41,038	54,976	35,384
Total	20,848,323	18,694,422	20,907,319	25,249,570

^a Includes coal consumed in Utah.^b Included with Pennsylvania.^c Includes New York.^d Included with Colorado.

In regard to this table, it is well to repeat what has been stated in some of the previous reports. In the first place, it is to be noted that in many cases the statement as to the amount of coal used in the production of coke is an estimate. At but few works is the coal weighed before being charged into the ovens. A great deal of the coke made in the United States is from run of mine—that is, all of the product of mining, lump, nut, and slack, as it comes to the mouth of the pit in the mine car, is charged into the ovens—and if no coal is sold as coal it is comparatively easy to ascertain from the amounts paid for mining what is the amount of coal charged into the ovens. But even in such cases considerable difficulty arises, from the fact that mining is paid for by the measured bushel or ton of so many cubic feet, while our statistics are by weight, and the measured bushel or ton is often not the equivalent of the weighed bushel or ton. It is also true that in certain districts where the men are paid by the car the car contains, even of

measured tons, more than the men are paid for. Under such circumstances it is not to the interest of the operator to weigh the coal as it is charged into the oven.

Further, in many districts coke making is simply for the purpose of utilizing the slack coal produced in mining or that which falls through the screen at the tippie when lump is sold. In such cases the slack is rarely, if ever, weighed as it is charged into the ovens, so that any statement as to the amount of coal used at such works will be an estimate. At some works the coal is often weighed for a brief period, and, the coke being weighed as it is sold, a percentage of yield is ascertained which is used in statements as to the amount of coal used and the yield of this coal in coke.

It is to be observed, however, that producers, particularly of the larger class where system and order are maintained, are each year keeping more accurate account of the coal charged into the ovens and of the coke obtained from it, whether used by themselves or marketed. For this reason the figures of the last few years are obtained from more exact data, but the comparatively slight changes shown in the next two tables indicate that the estimates made for earlier years were quite close.

Attention is here called to what appears to be a marked discrepancy between the figures contained in the above table and those shown in the chapter on the production of coal. In the coal report the amount of coal made into coke in the United States is given as 22,167,353 short tons, more than 3,000,000 tons less than that shown in the above table. In explanation of this it may be stated that this difference is in coal which is not made into coke at the mines, but it is shipped to ovens at a distance, much of it being sold as coal, and is therefore included in the statement of shipments. For instance, the coal report shows no coal made into coke in Illinois, Kansas, Missouri, or Wisconsin. In the last State mentioned coal is not even mined, the coke being made from coal purchased in Pennsylvania. In some cases the coal report shows a larger amount of coal made into coke than the coke report does. In this case the difference is due to the washing of the coal before coking, the weight of the coal before washing being reported in the one case, and the washed coal in the other case. In some of the less important States the figures are identical in both reports.

Coal required to produce a ton of coke, in tons or pounds.

Percentage yield of coal in the manufacture of coke in the United States from 1880 to 1898, inclusive, by States and Territories.

State or Territory.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.
Alabama	57	59	58	60	60	59	59	59	60	59
Colorado	49	50	57	60	64	63	62.6	64	65.6	63
Georgia	60	60	60	60	60	60	60	50	60	60
Illinois	41	42	45	43	43	48	46	55.5	56.9	60
Indiana	0	0	0	0	0	0	47	50	45	51
Indian Territory .	62	62	62	62	62	62	62	50	57	50
Kansas	64	64.4	65	62.9	62.3	53.7	54.2	54	59	64
Kentucky	60	60	59	60	64	53	50	50	54	52
Missouri	0	0	0	0	0	0	0	55	52	62

Percentage yield of coal in the manufacture of coke in the United States from 1880 to 1898, inclusive, by States and Territories—Continued.

State or Territory.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.
Montana	0	0	0	0	46	58.5	0	66.7	60	46
New Mexico	0	0	66.7	57.3	57.5	56.3	56	61	58	48
Ohio	58	59	57	58	58	57	59	56	54	56
Pennsylvania	65	64	64	65	62	64.6	65.2	65.3	68	66
Tennessee	60	60	60	62	63	53	59	61	61	57
Texas	0	0	0	0	0	0	50	0	0	0
Utah	50	0	50	0	0	0	0	0	0	34
Virginia	0	0	0	64.5	64.3	60	61.1	70.8	64.7	61
Washington	0	0	0	0	57.5	57	58.9	65	0	55
West Virginia	60	61	63	63	62	63	62	63.3	61.6	61
Wisconsin	0	0	0	0	0	0	0	0	50	62.5
Wyoming	0	0	0	0	0	0	0	0	0	0
Total average.	63	63	63	64	61	63	64	64.2	66	64

State or Territory.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.
Alabama	59	60	58	50	58.7	58.7	57.5	58.8	59
Colorado	60	61	63.9	^a 57.7	^a 58.5	^a 58.6	^a 56.9	^a 55.6	^a 59.1
Georgia	60	62.5	51.5	52.8	55.9	50.6	49	49.3	61
Illinois	55	52	66	66.7	57.9	62.5	66.7	43	35
Indiana	51	44	49.7	49.6	48.6	48.5	49	41.4	44.9
Indian Territory ..	50	46	50	47	42	43.8	40	44.3	46.5
Kansas	56	52	59.2	62.8	63.5	62.8	53.5	52.5	53
Kentucky	51	52	51	50	44.8	40.1	48.6	50	50
Missouri	65	66	65.8	66.5	65.4	65	55.9	56	49.3
Montana	45	47	53.6	48.5	52.2	45.4	53	48.5	56
New Mexico	51.5	57.5	0	39.5	50	65.5	61.7	55.6	55.6
New York				84.8		83.4			
Ohio	59	56	54.4	52	59	56	62.7	62.7	63.5
Pennsylvania	65	66	66.1	66	66.9	66.2	^b 66.1	^b 66.2	^b 65.7
Tennessee	58	58	59	59	56.6	57.9	56.5	55	54.6
Texas	0	0	0	0	0	54	0	56.3	0
Utah	35	31							
Virginia	66	58.8	65.3	64.5	64.2	59.6	58.9	61.6	62
Washington	64	60	58	59	61.2	65.9	67	67	62.2
West Virginia	59	58.8	60.5	60.8	60.4	61.6	61.4	61	61.2
Wisconsin	65	65	62.2	62	67	60	62	59	59
Wyoming	0	60	0	54	50	47.8	47.6	43.7	51.9
Total average.	64	63	64	63.5	64	64	63	63.5	63.6

^a Average, including Utah.

^b Average, including New York.

AMOUNT AND VALUE OF COAL USED IN COKE MAKING.

In the following table is presented a statement of the amount and value of the coal used in the manufacture of coke during the last three years, by States, the value of the coal per ton of coke made, and the amount of coal used in making one ton of coke. It will be observed that the total value of the coal used was \$16,259,766 in 1898, and, as shown in a preceding table, the value of the coke made from it was \$25,586,699. The amount of coal used was 25,249,570 short tons, yielding 16,047,209 tons of coke, or a percentage yield of 63.5. The value of the coke was practically \$1 per ton for the coal used; the value of the coal was practically \$1 per ton on the coke produced. The amount of coke produced was 63.5 per cent of the coal used; the value of the coke was 57 per cent more than that of the coal. The average value per ton of coal made into coke was 64.4 cents; the average value per ton of the entire bituminous-coal product in 1898 was 80 cents. About 27 per cent of the coal made into coke was slack, not included in the run of mine, and which, having little or no market value, makes the average value per ton smaller.

Amount and value of coal used in the manufacture of coke in the United States in 1898, and amount and value of same per ton of coke.

State or Territory.	Coal used.	Total value of coal.	Value of coal per ton.	Amount of coal per ton of coke.	Value of coal to a ton of coke.
	<i>Short tons.</i>			<i>Short tons.</i>	
Alabama	2,814,615	\$2,142,210	\$0.76	1.69	\$1.28
Colorado (a)	803,686	548,038	.68	1.69	1.15
Georgia	81,108	40,554	.50	1.637	.82
Illinois	6,650	1,662	.25	2.86	.715
Indiana	4,065	1,423	.35	2.23	.78
Indian Territory	73,330	51,908	.708	2.15	1.52
Kansas	7,856	4,015	.51	1.88	.96
Kentucky	44,484	6,235	.14	2.00	.28
Missouri	1,500	650	.433	2.03	.88
Montana	92,552	253,011	2.73	1.78	4.86
New Mexico	12,557	6,279	.50	1.80	.90
Ohio	134,757	127,924	.95	1.575	1.50
Pennsylvania (b)	16,307,841	10,346,448	.634	1.52	.96
Tennessee	722,356	418,598	.58	1.83	1.06
Virginia	852,972	495,539	.58	1.606	.93
Washington	48,559	89,155	1.836	1.61	2.956
West Virginia	3,145,398	1,619,575	.51	1.634	.84
Wisconsin	59,900	88,850	1.483	1.70	2.52
Wyoming	35,384	17,692	.50	1.93	.965
Total and averages.	25,249,570	16,259,766	.644	1.573	1.013

a Figures given for Colorado include the statistics of Utah.

b Figures given for Pennsylvania include the statistics of New York.

Amount and value of coal used in the manufacture of coke in the United States in 1897, and amount and value of same per ton of coke.

State or Territory.	Coal used.	Total value of coal.	Value of coal per ton.	Amount of coal per ton of coke.	Value of coal to a ton of coke.
	<i>Short tons.</i>			<i>Short tons.</i>	
Alabama	2,451,475	\$2,047,975	\$0.83½	1.70	\$1.42
Colorado (a)	616,592	441,450	.716	1.80	1.29
Georgia	67,000	33,500	.50	2.03	1.02
Illinois	3,591	1,436	.40	2.32	.93
Indiana	7,022	3,511	.50	2.49	1.25
Indian Territory	68,495	57,581	.84	2.25	1.89
Kansas	11,772	5,886	.50	1.90	.95
Kentucky	64,234	12,621	.20	2.00	.40
Missouri	4,627	2,698	.583	1.78	1.04
Montana	139,907	301,046	2.15	2.06	4.43
New Mexico	2,585	2,282	.88	1.80	1.58
Ohio	151,545	141,197	.93	1.59	1.48
Pennsylvania (b)	13,538,646	7,825,569	.578	1.51	.87
Tennessee	667,996	525,755	.787	1.81	1.42
Texas	700			1.78	
Virginia	574,542	315,986	.55	1.62	.89
Washington	39,124	77,377	1.98	1.49	2.95
West Virginia	2,413,283	1,290,468	.53	1.64	.87
Wisconsin	29,207	55,000	1.88	1.70	3.20
Wyoming	54,976	43,980	.80	2.29	1.83
Total and averages.	20,907,319	13,185,318	.63	1.57	.99

a Figures given for Colorado include the statistics of Utah.

b Figures given for Pennsylvania include the statistics of New York.

Amount and value of coal used in the manufacture of coke in the United States in 1896, and amount and value of same per ton of coke.

State or Territory.	Coal used.	Total value of coal.	Value of coal per ton.	Amount of coal per ton of coke.	Value of coal to a ton of coke.
	<i>Short tons.</i>			<i>Short tons.</i>	
Alabama	2,573,713	\$2,049,732	\$0.796	1.74	\$1.385
Colorado (a)	639,238	601,362	.94	1.76	1.65
Georgia	109,655	54,827	.50	2.04	1.02
Illinois	3,900	975	.25	1.50	.375
Indiana	8,956	4,360	.49	2.06	1.01
Indian Territory	53,028	43,257	.816	2.52	2.056
Kansas	8,940	4,170	.466	1.87	.87
Kentucky	55,719	14,521	.26	2.06	.536

a Figures given for Colorado include the statistics of Utah.

Amount and value of coal used in the manufacture of coke in the United States in 1896, and amount and value of same per ton of coke—Continued.

State or Territory.	Coal used.	Total value of coal.	Value of coal per ton.	Amount of coal per ton of coke.	Value of coal to a ton of coke.
	<i>Short tons.</i>			<i>Short tons.</i>	
Missouri	4,471	2,520	.56	1.79	1.00
Montana	113,165	194,747	1.72	1.88	3.23
New Mexico	39,286	25,918	.66	1.62	1.069
Ohio	128,923	190,755	1.01	1.59	1.606
Pennsylvania (a)	11,124,610	6,957,038	.625	1.51	.944
Tennessee	600,379	438,212	.73	1.77	1.29
Virginia	454,964	282,926	.62	1.70	1.05
Washington	38,685	69,420	1.79	1.49	2.67
West Virginia	2,687,104	1,394,827	.519	1.63	.846
Wisconsin	8,648	17,207	2.00	1.62	3.24
Wyoming	41,038	28,727	.70	2.10	1.47
Total and averages.	18,694,422	12,315,501	.659	1.585	1.04

a Figures given for Pennsylvania include the statistics of New York.

CONDITION IN WHICH COAL IS CHARGED INTO OVENS.

In the following table will be found a statement of the condition of coal when charged into ovens—that is, whether it is run of mine, slack, washed, or unwashed. The tables for 1893, 1897, and 1896 are given. The headings explain themselves. It is only necessary to state that run of mine, washed, includes that run-of-mine coal which is crushed before being washed.

Character of coal used in the manufacture of coke in 1898.

State or Territory.	Run of mine.		Slack.		Total.
	Unwashed.	Washed.	Unwashed.	Washed.	
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
Alabama	1,290,794	828,294	25,000	670,527	2,814,615
Colorado (a)	122,983	0	415,298	265,405	803,686
Georgia	0	61,844	0	19,264	81,108
Illinois	0	0	0	6,650	6,650
Indiana	0	0	0	4,065	4,065
Indian Territory ...	0	15,353	0	57,977	73,330
Kansas	0	0	7,856	0	7,856
Kentucky	0	1,800	0	42,684	44,484
Missouri	0	0	1,500	0	1,500
Montana	12,000	60,000	0	20,552	92,552
New Mexico	0	0	12,557	0	12,557

a Including Utah's consumption of coal.

Character of coal used in the manufacture of coke in 1898—Continued.

State or Territory.	Run of mine.		Slack.		Total.
	Unwashed.	Washed.	Unwashed.	Washed.	
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
New York					
Ohio	92,963	0	19,794	22,000	134,757
Pennsylvania (a) ...	14,083,073	350,153	1,472,347	402,268	16,307,841
Tennessee	37,217	306,969	122,756	255,414	722,356
Virginia	405,399	0	237,474	210,099	852,972
Washington	0	48,559	0	0	48,559
West Virginia	713,815	0	2,137,983	293,600	3,145,398
Wisconsin	0	0	0	59,900	59,900
Wyoming	0	0	35,384	0	35,384
Total	16,758,244	1,672,972	4,487,949	2,330,405	25,249,570

a Includes coal coked in New York.

Character of coal used in the manufacture of coke in 1897.

State or Territory.	Run of mine.		Slack.		Total.
	Unwashed.	Washed.	Unwashed.	Washed.	
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
Alabama	902,310	120,420	91,200	1,337,545	2,451,475
Colorado (a)	0	0	393,214	223,378	616,592
Georgia	0	67,000	0	0	67,000
Illinois	0	0	3,591	0	3,591
Indiana	0	0	0	7,022	7,022
Indian Territory ...	0	6,923	0	61,572	68,495
Kansas	0	0	11,772	0	11,772
Kentucky	4,176	0	0	60,058	64,234
Missouri	0	0	4,627	0	4,627
Montana	0	75,000	0	64,907	139,907
New Mexico	0	0	2,585	0	2,585
Ohio	92,192	0	29,353	30,000	151,545
Pennsylvania (b) ...	11,540,459	301,052	1,441,611	255,524	13,538,646
Tennessee	36,485	400,166	119,755	111,590	667,996
Texas	0	0	0	700	700
Virginia	286,158	0	227,363	61,021	574,542
Washington	0	39,124	0	0	39,124
West Virginia	373,205	28,145	1,800,528	211,405	2,413,283
Wisconsin	0	0	0	29,207	29,207
Wyoming	0	0	54,976	0	54,976
Total	13,234,985	1,037,830	4,180,575	2,453,929	20,907,319

a Includes Utah's consumption of coal.

b Includes coal coked in New York.

Character of coal used in the manufacture of coke in 1896.

State or Territory.	Run of mine.		Slack.		Total.
	Unwashed.	Washed.	Unwashed.	Washed.	
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
Alabama	1, 292, 191	70, 125	51, 674	1, 159, 723	2, 573, 713
Colorado (a)	143, 604	0	378, 776	116, 858	639, 238
Georgia	0	109, 655	0	0	109, 655
Illinois	0	0	0	3, 900	3, 900
Indiana	0	0	0	8, 956	8, 956
Indian Territory	0	0	0	53, 028	53, 028
Kansas	0	0	8, 940	0	8, 940
Kentucky	16, 271	0	0	39, 448	55, 719
Missouri	0	0	4, 471	0	4, 471
Montana	0	50, 000	0	63, 165	113, 165
New Mexico	0	0	39, 286	0	39, 286
Ohio	88, 616	0	24, 325	15, 982	128, 923
Pennsylvania (b)	9, 289, 089	273, 082	1, 463, 047	99, 392	11, 124, 610
Tennessee	0	206, 319	219, 231	174, 829	600, 379
Virginia	70, 756	0	370, 624	13, 584	454, 964
Washington	0	20, 967	0	17, 718	38, 685
West Virginia	407, 378	33, 096	2, 079, 237	167, 393	2, 687, 104
Wisconsin	0	0	5, 183	3, 465	8, 648
Wyoming	0	0	41, 038	0	41, 038
Total	11, 307, 905	763, 244	4, 685, 832	1, 937, 441	18, 694, 422

a Includes Utah's consumption of coal.

b Includes coal coked in New York.

One of the interesting features presented in the above tables is that the amount of slack coal used has shown practically no increase in three years, when the total has increased over 6,500,000 tons. The total coal used in 1896 was 18,694,422 short tons, of which 6,623,273 tons, or more than one-third, was slack. In 1898, when the total was 25,249,570 short tons, the slack used was 6,818,354, or but a little more than one-fourth. The washed run-of-mine coal used in 1898 was 60 per cent more than that of 1897, but the washed slack coal was somewhat less.

In the following table the statistics regarding the character of the coal for the year 1890 to 1898, inclusive, are consolidated:

Character of coal used in the manufacture of coke in the United States since 1890.

Year.	Run of mine.		Slack.		Total.
	Unwashed.	Washed.	Unwashed.	Washed.	
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
1890.....	14,060,907	338,563	2,674,492	931,247	18,005,209
1891.....	12,255,415	290,807	2,945,359	852,959	16,344,540
1892.....	14,453,638	324,050	3,256,493	779,156	18,813,337
1893.....	10,306,082	350,112	3,049,075	1,211,877	14,917,146
1894.....	9,648,750	405,266	3,102,652	1,192,082	14,348,750
1895.....	15,609,875	237,468	3,052,246	1,948,734	20,848,323
1896.....	11,307,905	763,244	4,685,832	1,937,441	18,694,422
1897.....	13,234,985	1,037,830	4,180,575	2,453,929	20,907,319
1898.....	16,758,244	1,672,972	4,487,949	2,330,405	25,249,570

IMPORTS AND EXPORTS.

The following table gives the quantities and value of coke imported and entered for consumption in the United States from 1869 to 1898, inclusive. In the reports of the Treasury Department the quantities given are long tons. These have been reduced to short tons to make the tables consistent with the other tables in this report.

Coke imported and entered for consumption in the United States, 1869 to 1898, inclusive.

Year ending—	Quantity.	Value.	Year ending—	Quantity.	Value.
	<i>Short tons.</i>			<i>Short tons.</i>	
June 30, 1869.....		\$2,053	June 30, 1884.....	14,483	\$36,278
1870.....		6,388	1885.....	20,876	64,814
1871.....		19,528	Dec. 31, 1886.....	28,124	84,801
1872.....	9,575	9,217	1887.....	35,320	100,312
1873.....	1,091	1,366	1888.....	35,201	107,914
1874.....	634	4,588	1889.....	28,608	88,008
1875.....	1,046	9,648	1890.....	20,808	101,767
1876.....	2,065	8,657	1891.....	50,753	223,184
1877.....	4,068	16,686	1892.....	27,420	86,350
1878.....	6,616	24,186	1893.....	37,183	99,683
1879.....	6,035	24,748	1894.....	32,566	70,359
1880.....	5,047	18,406	1895.....	29,622	71,366
1881.....	15,210	64,987	1896.....	43,372	114,713
1882.....	14,924	53,244	1897.....	34,937	98,077
1883.....	20,634	113,114	1898.....	46,127	142,334

The amount and value of coke exported from the United States since 1895 are shown in the following table:

Coke exported from the United States since 1895.

Year.	Quantity.	Value.
	<i>Short tons.</i>	
1895.....	131,368	\$425,174
1896.....	169,189	553,600
1897.....	193,798	546,066
1898.....	223,509	600,931

BY-PRODUCT COKE MAKING IN 1898.

The by-product coking industry in 1898 was marked more by the completion of new ovens and the large number under construction during the year than by the increase in the production of by-product coke. At the close of 1897 there were 280 by-product ovens in operation and 240 in course of construction, the production from the completed ovens amounting during the year to 261,912 short tons. During 1896 the number of ovens in operation was 160, producing 83,038 tons of coke, while 120 ovens were building at the close of the year. These 120 ovens were added to the active plants in 1897, and helped to swell the output to more than three times that of the previous year. The 240 ovens which were building at the close of 1897 were completed in 1898, bringing the total number of completed ovens up to 520. The new ovens, however, were not put in blast until late in the year and produced altogether only a little over 30,000 tons of coke, while the total production of coke in by-product ovens in 1898 was 294,445 short tons, an increase of 32,533 short tons over 1897. These figures show that the production from the 280 ovens which were operated in both 1897 and 1898 increased their output about 2,000 tons in 1898. At the close of 1898 there were 500 ovens in course of construction, including the plant of 400 at Everett, Massachusetts, for utilizing Nova Scotian coal. By this it will be seen that the number of by-product ovens building at the close of 1898 was only 20 less than the entire number previously constructed.

Reduced to tabular form, the record of by-product coke making in the United States since 1893, when the first plant was constructed at Syracuse, has been as follows:

Record of by-product coke making since 1893.

Year.	Ovens.		Product. <i>Short tons.</i>
	Built.	Building.	
1893	12	0	12,850
1894	12	60	16,500
1895	^a 72	63	18,521
1896	160	120	83,038
1897	280	240	261,912
1898	^b 520	^c 500	294,445

^a Sixty of these ovens did not begin making coke until 1896.

^b Includes 280 Semet-Solvay, 180 Otto-Hoffmann, and 60 Newton-Chambers.

^c All Otto-Hoffmann.

In the foregoing table, and in the discussion which precedes it, no account is taken of the 30 Newton-Chambers ovens constructed at Latrobe, Pennsylvania, in 1896, and which have not been operated as by-product ovens, nor of 3 experimental Slocum ovens at Bolivar, which have never been operated at all.

THE SEMET-SOLVAY BY-PRODUCT COKE PLANT AT ENSLEY, ALABAMA.

The following description of the ovens erected by the Semet-Solvay Company, in connection with the Tennessee Coal, Iron, and Railroad Company, at Ensley, Alabama, is abstracted from a paper by Mr. William H. Blauvelt in the Transactions of the American Institute of Mining Engineers:

The ovens at the Ensley plant are of the Semet-Solvay horizontal flue type.

In this oven the designers have developed the principle that the flue walls should be thin, to permit the ready passage of the heat to the coal, and that the weight of the top of the oven, which is necessarily thick and heavy to retain the heat, should be removed from the thin, almost white hot flue walls and carried independently.

A solid fire brick wall, 18 inches thick, is therefore placed between each two ovens to carry the load of the roof, coal cars, tracks, and whatever may be placed on it. Each oven, therefore, has its separate sets of flues, which may be entirely removed if necessary without affecting the general structure; and carrying no load, they are free to expand and contract with the changes of the temperature incident to the introduction of the coal charge and its heating up to the point necessary to complete the coking process. Moreover, thick brick walls form a reservoir of heat that is of considerable assistance in keeping the temperature of the oven uniform. Thus the design of the oven is such as to give a maximum life to the flues (which are the only part of the oven that can wear out), while at the same time it admits of their ready repair, should it be necessary, without affecting any other ovens in the block.

The plan of introducing the gas in several places and at the ends of the horizontal flues gives perfect control over the heats of each flue, and permits their examination at any time to see that the proper temperatures are maintained. This arrangement insures that each flue shall have just the temperature best suited to the work to be performed, and prevents one part of the oven being overheated while another is too cool.

The plant of Semet-Solvay ovens at Ensley consists of 120 ovens, arranged in two parallel blocks of sixty each. The coal used is the washed slack from the Pratt seam, and it is expected that the plant when in full run will produce from 420 to 460 tons of coke per day. The coke will be consumed by the Ensley furnaces.

In the design of the plant careful attention has been given to the problem of handling materials with a minimum of labor, and at the same time elaborate handling of machinery has been avoided as being unsuited to the class of labor most available.

A spur from the track leading from the Pratt coal mines and washers is carried directly over the coal bins above the ovens, the track having a grade at the steepest part of 1.05 feet per hundred, so that a locomotive can deliver a day's supply of coal at one shift.

The coal is delivered in 30-ton cars with sloping hopper bottoms, and one laborer can easily dump in ten hours the whole day's supply. The bins have a capacity of 1,500 tons of coal to provide against any irregularity in the supply.

The coal for charging the ovens is drawn into larries below the bins and charged into the ovens as above described.

When coked the charge is pushed from the oven by a steam ram, and quenched as it falls onto a car provided for the purpose. This car is 30 feet long and 7 feet wide, with a sloping bottom, and is so arranged that when pushed out on it the coke lies in a thin even layer that permits complete quenching with a minimum resultant moisture in the coke.

The blocks of ovens are located at right angles to the line of the Ensley furnaces and about 350 feet distant from the stock house. This arrangement permits the most convenient delivery of the coke to the stock house. By a wire rope and winding engine the quenching cars are drawn up a grade of 1 to 6 into the stock house to an elevation sufficient to permit the coke to be dumped into a large bin with a sloping bottom, which in turn discharges directly into the furnace buggies that are sent to the tunnel head. Thus the coke is moved but three times after it is quenched until it lies in the furnace, and the breakage is reduced to a minimum. A coke fork becomes a useless utensil, with a corresponding reduction of labor.

Turning now to the by-products from the coking plant, the by-product building is located midway between the two blocks of ovens and is of slow burning mill construction. Two sets of gas condensers, one for each 30 ovens, are at each end of the building, and beyond them at one end is the sulphate of ammonia house. Within the building are the necessary exhausters, washers, pumps, tanks, etc., for collecting the by-products.

Immediately adjoining the property on the west is a tar-distilling plant, and the tar collected from the gas, after being measured, is pumped directly from the by-product building to its receiving tanks. This plant produces from the tar roofing pitch, tar paper, and creosoting oils, for all of which products there is a market in the South.

The ammonia produced is at present manufactured into sulphate of ammonia. As the ammonia is condensed out of the gas it is collected in the form of a weak liquor containing probably not more than 1 per cent of NH_3 , along with a good many impurities. To make the sulphate this liquor is distilled with steam and the resulting ammonia gas is absorbed in a bath in sulphuric acid and contained in a lead-lined tank. The crystals of sulphate fall to the bottom, whence they are raked out, drained, and bagged for shipment.

The sulphate of ammonia finds a ready market, as there are large fertilizer factories in a number of the Southern States, and sulphate is one of the most valuable sources of nitrogen obtainable. It is worth more per unit of nitrogen than nitrate, blood, or any of the other usual sources of this important element.

Anhydrous ammonia—that is, ammonia gas condensed by compression into the liquid form, is used in large quantities throughout the South in the manufacture of artificial ice. This form of ammonia is not produced in the Ensley plant as yet, but it may be arranged for later.

The surplus gas from the plant, of which there will be some 2,000,000 cubic feet or more per day, is to be used in the new basic open hearth steel mill that is being erected within a short distance of the oven plant. This gas will doubtless prove to be of more value as an auxiliary than as a direct substitute for producer gas in the open-hearth furnaces. It will be a great convenience for drying ladles, heating soaking pits, or in other places where comparatively small quantities of gas are required, and of a better quality than ordinary producer gas. It has been suggested that the open-hearth furnaces be piped for the coke-oven gas in order to provide an easy means for rapidly controlling the heats, if the occasion should arise.

While the oven plant is not yet in full run, enough work has been done to make a reliable comparison between the production of the coke from this plant and from the beehive ovens of the Birmingham district. It is the practice of some of these plants to coke two forty-eight hour charges and one seventy-two hour charge per oven per week. At other places it is more common to run one seventy-two and one ninety-six hour charge per week. A comparison of the output of the by-product ovens and the beehive shows that the 120 ovens in the by-product plant will equal in production about 300 beehives, making forty-eight and seventy-two hour coke, and about 340 beehives running on seventy-two and ninety-six hour charges. The charges of coal are heavier when the beehives make only two charges per week.

This difference in the output per oven of the beehive and retort oven plants is due to the more rapid coking in the retort oven, although the individual charges are smaller, and also to the increased yield in coke per ton of coal due to the improved method of coking. Careful tests have shown that this increased yield adds from one-sixth to one-fifth to the amount of coke produced from a ton of Pratt coal.

A comparison of the labor on a beehive plant of 300 ovens, compared with that on the plant of 120 by-product ovens as operated at Ensley, shows that the by-product plant requires but about 15 per cent more hours labor per day than the beehive plant.

In the former are included all men required about the plant, delivering the coke into the furnace stock house, loading the sulphate of ammonia into cars, and delivering the tar to the purchaser, while in the latter are included only the men required to charge, level, water, and draw the ovens and to load the coke on to cars. The delivery of the coke is a question of location. If the ovens were not at the furnace plant the coke would be delivered into railroad cars.

THE SEMET-SOLVAY BY-PRODUCT COKE OVENS AT WHEELING, WEST VIRGINIA.

The following brief description of the newly constructed Semet-Solvay recovery ovens at Wheeling, West Virginia, has been prepared for this report by Mr. W. H. Blauvelt, of Syracuse, New York:

The plant of Semet-Solvay by-product ovens at Wheeling, West Virginia, consists of 120 ovens, 60 of which have been in operation since December, 1898, and 60 of which are now in course of erection. The construction of the second half of the complete plant was delayed until a thorough trial of the coke had been made in the furnace and it had proved to be satisfactory.

The first 60 have a capacity of about 200 tons of coke per day, while the ovens now being built are of larger size and will produce about 270 tons daily, giving a total daily production for the plant of 470 tons.

This coke is made from Connellsville coal and is used in the blast furnaces of the Riverside Iron Works. The ovens are located near to the Riverside Iron Works plant, permitting the delivery of the coke and gas at a minimum cost. The arrangement of tracks and coal handling apparatus secures a very low cost for delivering the crushed coal into the ovens from the railroad cars, and ample storage capacity is provided to guard against trouble from irregularities in the coal supply. Both the coal-handling and the coal-storage machinery are of the Link Belt Engineering Company design, the storage plant having a capacity of about 4,000 tons.

The coke is discharged from the ovens by the usual steam ram and falls on to a specially designed quenching car with sloping bottom, which permits the coke to be quenched with the minimum quantity of resultant moisture.

The car is drawn to the top of the coke-storage bin by means of a special locomotive, which is fitted with a winding drum at one end, so arranged that when the locomotive and car reach the foot of the 20 per cent incline leading to the top of the coke bin a stationary rope is hooked into the drum and the locomotive winds itself and the car up to the top. The bin is arranged to deliver the coke directly into the furnace buggies, screening out the breeze as the buggies are filled, or, if desired, into railroad cars for shipment.

The by-product building is located between the two blocks of sixty ovens, and contains all the apparatus for the cooling and scrubbing of the gas and the separation of the tar and ammonia. It is built entirely of steel and carries a large flat water tank on top. The water supply is mainly taken from two artesian wells, 300 feet in depth and 8 inches in diameter, by the Pholé system, the air being used at 125 pounds pressure. A portion is also pumped from the Ohio River.

The surplus gas, over what is required for heating the ovens, is sent through a regulating holder to the works of the Riverside Iron Company, where it is used for various purposes, principally to heat the galvanizing pots in the pipe works.

As a whole the plant is very completely equipped, and is built in a substantial manner.

THE OTTO-HOFFMANN BY-PRODUCT COKE PLANT AT EVERETT, MASSACHUSETTS.

At the close of 1898 the plant of 400 Otto-Hoffmann ovens, in course of construction at Everett, Massachusetts, was nearing completion, and at the time of writing this report, July, 1899, 100 ovens have been put in blast, and preparations are making to start the others as rapidly as possible. The plant at Everett occupies a unique position

in the coke-making industry, in that the coal from which the coke is made is drawn from the mines of the Dominion Coal Company in Nova Scotia, and the coke product is not intended primarily for metallurgical purposes, though it is proposed to furnish furnace, foundry, and other metallurgical demands if they arise. Notwithstanding these conditions, however, it has been considered that the operations of the plant should be included in these reports, and in anticipation of this product being added to the statistical records in future volumes, the following description of the plant, prepared for this report by Mr. F. E. Saward, editor of the Coal Trade Journal, is presented. At the instance of this office, Mr. Saward visited the works during July of this year (1899), while the preparation of the report was in progress, so that the information contained is the latest obtainable.

A recent visit (July, 1899) to the works at Everett shows great improvement and enlargement since a former visit. Nearly the whole of the 160 acres is now covered with buildings, in which all the appliances for the manufacture of coke and its by-products are to be carried on.

Only 100 ovens were in use at the time and the product thereof sold, but a second 100 was being heated and would be in operation by September 1. The coke product of these ovens is now largely sold for steam-raising, although some retail dealers are buying the large coke and breaking it up for their trade. It is said that ten engines on the Boston and Maine road are now using it, and the result is satisfactory from the time made with it, and the fact that there is no smoke or cinders sent out of the engine to annoy the passengers in the train following.

Much that has been said against this coke is unwarranted, for everywhere that it has been used on locomotive engines, after the firemen have become accustomed to the way it should be handled, it is a success. The man used to firing with hard or soft coal does not at once see the necessity of giving air to the coke for the purpose of combustion and the necessity of keeping up a steady fire. It is, perhaps, more work for the fireman, but he soon gets accustomed to the ease of handling it, and the way it does its work, and he likes it. There is considerably less ash to dispose of, and this is an important feature, as the fireman does not have to be before the open door and in the heat of the furnace so frequently.

The coal is brought from Nova Scotia in steamers carrying about 4,500 tons each. It is of a fine grade, cubical in form. Although it is known as culm, it is not dust, according to the usual idea of this coal, and, as said, all the particles have a cubical form. The vessels lie at a wharf which is 550 feet long and where there is 24 feet of water at low tide. In addition to this wharf space, there is a pier front on the river of about 800 feet. On the wharf proper is an elevated steel pocket which has a capacity of 6,000 tons. On top of this pocket are three steel towers for unloading the coal by means of buckets. The buckets

hold a ton and a half each, and it is said that a record of 500 tons in an hour by the three buckets has been made. From the pockets on the wharf the coal is delivered to cars having a capacity of $2\frac{1}{2}$ tons each and equipped with a patent automatic grip and release, which is the invention of Louis J. Hirt, the engineer for the New England Gas and Coke Company. These cars are hauled up an aerial railway which extends from the floor of the wharf to the top of the oven coal pockets and coal-storage plant located over the several batteries of ovens, the distance from the nearest being 900 feet and the grade 17.66. There are 4 of these oven pockets, having a capacity of 2,000 tons each. From the pockets the coal is delivered into a larry, or conveyor, which takes 6 tons at a charge, and delivers the coal, from three points to three several charging holes, over the battery of ovens, there being 50 ovens to each battery. An electric car is used for driving this conveyor. The ovens are the usual form of what is known as the Otto-Hoffmann oven, and the coal is charged each twenty-four hours, the yield being said to be 70 per cent of coke in weight. There is also 10,000 cubic feet, gross, of gas, half of which is 14 candlepower, and the remainder is about 6 candlepower. The latter is returned for heating the ovens. Part of the gas is scrubbed for tar and ammonia, and is said to yield 12 gallons of tar to the ton of coal carbonized and from 26 to 28 pounds of sulphate of ammonia. The gas from the ovens passes into mains, where there is practical distillation, then to the condensing house, and thence to the Massachusetts pipe line. The secondary gas goes to the combustion chambers of the coke ovens, as already noted.

The gas works are on an extensive scale, and wherever possible electricity is used for all mechanical power about the coke-oven plant. An engine of 800 horsepower drives a generator of 400 kilwatts. In this connection must be noticed an ingenious apparatus whereby an additional engine for power can be changed from gas to steam, or from steam to gas, as might be considered necessary. This is the invention of the engineer, Mr. Hirt. The engine is 800 horsepower and 400 kilwatts.

The boiler house contains four 500-horsepower Babcock & Wilcox boilers, and the furnaces to run them are fired with the refuse coke. Personal inspection showed that there is very little clinker and a very hot fire. The coke is supplied to an elevator running above the boilers, and thence down a spout to the door of each furnace. This spout is fitted with an automatic weighing apparatus, so that the amount of coke used at each furnace, or boiler, is readily known.

The gas holder is said to be the largest in the United States. It is 225 feet high and 198 feet in diameter, and has a capacity of 5,000,000 cubic feet.

The purifying house is the largest in the world; is 270 feet long and 120 feet wide, and has a capacity for handling 20,000,000 cubic feet of

gas a day. It is the intention of the company, as the work grows, to build a duplicate of the purifying house and gas holder.

The mains which leave the works are two in number, and are 42 inches diameter. When the lines are extended to Lynn, Chelsea, etc., there will be two additional mains, of 36 inches diameter.

Each of the ovens is capable of producing over four tons of coke daily, and it will thus be seen that when the entire force of 400 ovens is in complete working order, there will be a large quantity of coke available for the market, and a considerable tonnage will be had with which to displace the present fuels now in use, or to take up what would otherwise be the increase of the coal trade in New England.

The gas to be sold will be delivered to the Massachusetts Pipe Line Gas Company for sale and distribution by it, to the many gaslight companies of Boston and vicinity, with which long-term contracts have been made. They are to take this gas from the holders of the New England Gas and Coke Company, and enrich it to the standard illuminating power, and then distribute it to their several consumers. This is a source of considerable revenue to both the companies mentioned.

The coal tar made is taken by the National Coal Tar Company, and as is well known, there is a growing demand for this product throughout the United States for use in street paving and otherwise. The company is now erecting on the grounds of the New England Gas and Coke Company a large building to be used as a distilling plant, where the raw tar is prepared for the several purposes to which it may be put.

The proposition, so far as fuel gas is concerned, is to supply it to wholesale consumers when the works are in readiness for this branch of the business. It has been stated in the public prints by Mr. Whitney that he can supply parties using 25-horsepower engines with this fuel gas at the cost of their present coal supply, putting the consumption of coal at 6 pounds per horsepower per hour, which is a very low relative consumption. For engines of a greater power the cost would decrease per horsepower as compared with coal, from even this low rate. The gas which would be supplied is a 14-candlepower gas of no particular value as an illuminant, but quite so for fuel purposes, and doubtless there will be many parties who will gladly avail themselves of this new fuel when it is ready for delivery.

That there is already a trade in this coke for delivery to outside parts is readily seen from the long string of loaded cars about the works. These are of the regulation standard pattern of 60,000 pounds capacity.

The coke made at this plant is simply the carbon of the coal left in the ovens after the expulsion of the volatile substances by heating. It is these volatile substances which are the smoke producers, and by the coking the coal has been freed from the substances that cause spontaneous combustion, and it can be safely kept almost anywhere and for any length of time. It makes the hottest of fires, which are easily and

promptly controlled, and it kindles quickly. From a hygienic point of view it is the best and safest solid fuel on the market. Although this is somewhat of a new fuel in the United States, it has long been a success in Europe and in England, and even the plant at Pittsburg has sold its products in Cleveland and other cities with the greatest success, while the small plant at Halifax, which has now been running for over a year, produces a fuel which is recommended by its users for all purposes for which coal has heretofore been used.

The works are in charge of George H. Finn, as general manager of the New England Gas and Coke Company, assisted by Louis G. Hirt, chief engineer, and an able staff. The employees at present number something like 700.

Mr. John F. Wilcox represents the United Coke and Gas Company of Pittsburg, which has charge of the erection of the several structures going to complete this important industrial plant.

THE NEWTON-CHAMBERS BY-PRODUCT COKE OVENS AT POCAHONTAS, VIRGINIA.

During the year the Southwest Virginia Improvement Company has converted 56 of its beehive ovens at Pocahontas, Virginia, into by-product ovens of the Newton-Chambers system. A 14-inch air pipe is laid in the covering to the ovens the entire length of the block, and from this 6-inch terra-cotta pipes, running around the crowns of the ovens, lead the air into the oven. A fan forces air into the top of the oven through these pipes, the trunnel head being closed by an iron plate and the door sealed all the way up. The heat for coking is produced by the burning of the gas in the top of the oven in the presence of this forced draft of air. It requires less than one-third of the gas to produce the coking heat, and the remainder of the gas, as it comes off, is drawn by suction from the bottom of the oven through a pipe leading from the bottom of the oven out under the yard to a main running the length of the yard. These outlet pipes are 6 inches in diameter, the main being 42 inches in diameter. This main has a gradual fall to a primary washer situated at one end of the block, where the gas, at a temperature of 150° F., deposits the heavy oils, which are pumped to storage tanks. From this primary washer the gas passes into a cooler, which reduces its temperature to less than 80° F., and it is then passed through a scrubber and scrubbed under a vacuum in water, the oil and ammonia in the gas forming an emulsion with the water. The gas then passes through the exhauster and beyond, where it is carried to the boilers and tar still and ammonia house, where it is utilized as fuel. The emulsion from the scrubber is then pumped to storage tanks and mixed with the heavy oil, when the whole is permitted to settle some twenty-four hours, at the end of which time a partial separation of the oil and water takes place, the ammonia being present in both.

The oils mixed with the ammonia and water are then taken to an oil still and distilled, the product obtained being water saturated with

ammonia, which comes off first, followed by oils of increasing density, beginning with a very light oil of a specific gravity lighter than water. A residue of pitch is obtained which is run into molds. The water saturated with ammonia from the tar still is then mixed with the water which has separated from the oil by gravity, and the whole is then put through an ammonia still and converted into sulphate of ammonia.

This plant has only been in operation a month or so, and no reliable data can yet be obtained as to the quantity of by-products or their value. Enough is known, however, to say that a considerable amount of additional coke is obtained per ton of coal coked, besides the oil, pitch, and ammonia.

ADDITIONAL BLOCK OF OTTO-HOFFMANN OVENS AT JOHNSTOWN, PENNSYLVANIA.

The addition of 100 new ovens of the Otto-Hoffmann type to the previously constructed plant of 60 at Johnstown, Pennsylvania, possesses special interest. These ovens were begun in 1898, and had not been completed at the time of writing this report. The special interest attached to the construction of these ovens is the seeming refutation of the statement that by-product coke is inferior to beehive coke for blast-furnace practice. The coke product of the 60 ovens already established is consumed by the Cambria Steel Company, and the product of the new plant will be used by the same concern. As the Cambria Steel Company owns also a number of beehive ovens, it is evident from the construction of this new block that the retort coke is considered satisfactory as a blast-furnace fuel.

The new ovens are built upon an embankment which is about 10 feet above the level of the railroad tracks. The coke is pushed out of the ovens by a steam ram into a quenching car which moves along a track over the railroad track, and after being quenched the coke is dropped through the bottom of the quenching car directly into the gondola cars beneath. The handling of the coke and the labor cost is thus reduced to a minimum.

THE BAUER COKE OVEN.

This oven has not been introduced into the United States, but it is attracting some attention in Europe. A bank of this type of ovens has been in operation about three years at the Hanover colliery, in Germany, owned by the Krupps. The oven, as described in Stahl und Eisen, is of the recovery type, and is worked in three separate ways: (1) Without recovery of by-products; (2) with recovery of by-products; and (3) with a combination of the two systems, whereby the rich gases given off during the first stages of the coking process are used in a different manner from the poor and very hot gases given off toward the close of the operation.

The Bauer ovens are built in small units, there being only 8 ovens in a battery, and each oven holds 9 tons of coal. During 1898, when

the Hanover plant was operated on a coal containing 12 per cent of water and 67 to 69 per cent of fixed carbon and ash, the yield of coke was 73.3 per cent. The normal coking time has been taken at thirty hours, although for two months it varied from thirty-two to thirty-four hours, and for the remainder of the time was as high as forty-eight hours.

The Bauer vertical oven has been in use at Creusot, France, working on a mixture of bituminous and anthracite coal, from which a yield of 81.5 per cent of coke is said to have been obtained. At the Hanover plant the Bauer oven during fifteen months yielded 4 per cent above the so-called theoretical yield in coke, and Dr. Kassner and Dr. Bauer are of the opinion that the deposition of carbon accounts for this difference. It is true that deposition of carbon may go on under certain conditions and that there may be enough of it to account for the practical yield being above the theoretical yield. But whether or not this is really the case and what are the conditions governing such deposition are largely undetermined. A very thin sheet of deposited carbon will cause ordinary coke to appear silvery, so that an opinion as to the amount of deposited carbon present based on the appearance of the coke would be unreliable.

PRODUCTION OF COKE, BY STATES.

ALABAMA.

Alabama is one of the six States whose aggregate product in 1898 represented 98 per cent of the total amount of coke made in the United States during that year. This State ranks third in importance, being preceded by Pennsylvania and West Virginia. Since 1880 Alabama has occupied from second to fifth place, having been second 9 times, third 6 times, and fourth and fifth 2 times each. The coke product of Alabama in 1898 was 1,663,020 short tons, as compared with 1,443,017 tons in 1897, and 1,479,437 tons in 1896. Prior to 1898 the largest production in any one year was in 1892, when a total output of 1,501,571 tons was obtained. The product in 1898 was 220,003, or 15 per cent larger than 1897, and 161,449, or 11 per cent larger than that of 1892. It was larger also than the coke product of West Virginia for any year prior to 1898, but was 260,000 short tons less than West Virginia's output last year. It is not probable that Alabama will regain second place if the statistics as presented in this report may be taken as a guide. In 1898 West Virginia had 8,659 ovens built, an increase of 255 over 1897; Alabama had 5,456 ovens built, an increase of only 91 over the preceding year. In December, 1898, Alabama was building 100 new ovens, and West Virginia 161. In only one respect did Alabama have the advantage of her rival State, and this was in the smaller number of idle ovens. Alabama's idle ovens in 1898 numbered 386, and West Virginia's 568. It is probable that among the latter, as well as in the total number of ovens in the State, are included some banks of "dummy" ovens, constructed to comply with lease contracts, but which have not been, nor could not be operated.

Alabama, however, possesses an advantage over West Virginia that more than makes up for the difference in tonnage. It lies in the fact that the State consumes practically all of its own coke product, supporting iron and steel making industries which bring material prosperity to the State, and give employment to a higher class of labor than that supported by coal mining and coke making alone. West Virginia on the other hand, except for a comparatively small amount consumed in Wheeling and vicinity, ships its entire product of coke, and nearly all of its coal outside of the State for consumption, and, as stated, this advantage for Alabama outweighs the advantage possessed by West Virginia in its larger production of coke. A small amount of Alabama coke has been exported to Mexico.

The coal fields of Alabama are divided into three subdistricts, known as the Warrior, the Coosa, and the Cahaba, these districts being named from the rivers which drain them. Coke ovens are built in all three districts, but coke has been made for the last four years in but two—the Warrior and the Cahaba. The most important of these districts, both as a coal producer and coke maker, is the Warrior, the ovens in this district being located near Birmingham.

Of the 5,456 ovens in the State, 4,829 are in the Warrior district, and of the total production of 1,663,020 tons in 1898, 1,602,672 tons were made in the Warrior district.

While most of the ovens built in the State are of the ordinary beehive pattern—the more recent ones being of the usual dimensions, 12 feet in diameter and 7 feet high—it is evident from the frequent attempts that have been made to introduce other ovens that the beehive oven as a coker of Alabama coal is not entirely satisfactory. The ovens other than beehive, which had up to 1898 been introduced successfully into Alabama, are solid-wall ovens, or ovens in which there are no flues in the walls, and in which the coking chamber or combustion chamber, wherein the heat for coking is produced, are the same. Two forms of these modified solid-wall ovens are in use in Alabama at the present time, one known as the "Thomas" oven, which has already been described in this series of reports, and the other as the "double oblong." These ovens are 21 feet long and 9 feet wide, open at both ends. The ovens are charged from the top and drawn at the ends. They produce in a given time about 75 per cent more coke than the ordinary beehive oven.

During 1897 plans were laid for the construction of 120 Semet-Solvay by-product ovens at Ensley, near Birmingham. Thirty of these ovens were completed by September and put in operation immediately. The entire plant was completed in December, and put in blast. A few days later, on December 28, the buildings were destroyed by fire, which temporarily suspended operations. The works were immediately rebuilt, the repairs being completed in February, 1899, and operations resumed. The coke and gas is consumed by the Tennessee Coal, Iron and Railway Company at its furnaces. A description of the plant is given on a preceding page.

The statistics of coke production in Alabama since 1880 are as follows:

Statistics of the manufacture of coke in Alabama from 1880 to 1898, inclusive.

Year.	Estab- lish- ments.	Ovens.		Coal used.	Coke pro- duced.	Total value of coke at ovens.	Value of coke at ovens, per ton.	Yield of coal in coke.
		Built.	Build- ing.					
				<i>Short tons.</i>	<i>Short tons.</i>			<i>Per ct.</i>
1880..	4	316	100	106,283	60,781	\$183,063	\$3.01	57
1881..	4	416	120	184,881	109,033	326,819	3.00	59
1882..	5	536	-----	261,839	152,940	425,940	2.79	58
1883..	6	767	122	359,699	217,531	598,473	2.75	60
1884..	8	<i>a</i> 976	242	413,184	244,009	609,185	2.50	60
1885..	11	1,075	16	507,934	301,180	755,645	2.50	59
1886..	14	<i>a</i> 1,301	1,012	635,120	375,054	993,302	2.65	59
1887..	15	1,555	1,362	550,047	325,020	775,090	2.39	59
1888..	18	2,475	406	848,608	508,511	1,189,579	2.34	60
1889..	19	3,944	427	1,746,277	1,030,510	2,372,417	2.30	59
1890..	20	4,805	371	1,809,964	1,072,942	2,589,447	2.41	59
1891..	21	5,068	50	2,144,277	1,282,496	2,986,242	2.33	60
1892..	20	5,320	90	2,585,966	1,501,571	3,464,623	2.31	58
1893..	23	5,548	60	2,015,398	1,168,085	2,648,632	2.27	58
1894..	22	5,551	50	1,574,245	923,817	1,871,348	2.025	58.7
1895..	22	5,658	50	2,459,465	1,444,339	3,033,521	2.10	58.7
1896..	24	5,363	-----	2,573,713	1,479,437	3,064,960	2.07	57.5
1897..	25	5,365	<i>b</i> 120	2,451,475	1,443,017	3,094,461	2.14	58.8
1898..	25	<i>c</i> 5,456	100	2,814,615	1,663,020	3,378,946	2.03	59

a One establishment made coke on the ground.

b Semet-Solvay ovens.

c Includes 120 Semet-Solvay ovens.

The character of the coal used in the manufacture of coke in Alabama since 1890 is shown in the following table:

Character of coal used in the manufacture of coke in Alabama since 1890.

Year.	Run of mine.		Slack.		Total.
	Unwashed.	Washed.	Unwashed.	Washed.	
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
1890.....	1,480,669	0	206,106	123,189	1,809,964
1891.....	1,943,469	0	192,238	8,570	2,144,277
1892.....	2,463,366	0	11,100	111,500	2,585,966
1893.....	1,246,307	51,163	292,198	425,730	2,015,398
1894.....	411,097	7,429	477,820	677,899	1,574,245
1895.....	1,208,020	0	32,068	1,219,377	2,459,465
1896.....	1,292,191	70,125	51,674	1,159,723	2,573,713
1897.....	902,310	120,420	91,200	1,337,545	2,451,475
1898.....	1,290,794	828,294	25,000	670,527	2,814,615

As shown in the above table, practically 50 per cent of the coal used in making coke in Alabama during the last four years has been washed before being charged into the ovens. Experience has shown that the coke product from some of the Alabama coal is much improved by washing the coal. Not only is the percentage of ash and sulphur reduced, but the physical structure of the coke is improved. From 1890 to 1892 washing the coal was done in an experimental manner. The next three years showed a rapid increase in the amount of washed coal used, and now more than half the coal charged into the ovens is washed. The amount of washed slack used in 1898 was about half that of 1897, the difference being made up by washed run of mine.

COLORADO.

Colorado stands fifth among the coke producers in 1898, advancing from sixth place in 1897. Among the States west of the Mississippi River it stands preeminently at the head, occupying a prominence similar to that of Pennsylvania east of the river. Colorado's coke production in 1898 was 2.2 times the total product of all the other States west of the Mississippi River, and Pennsylvania's product was 2.3 times that of all the States east of that line of division. The total amount of coke made in Colorado in 1898 was 445,982 short tons, an increase over 1897 of 126,946 short tons, or 40 per cent. Virginia was the only other important producer which showed so large a percentage of increase. Coke production in Colorado reached its maximum in 1898. Prior to that the record was made in 1892, with a total of 365,920 tons, and compared with which the product in 1898 shows an increase of 80,062 tons, or 22 per cent.

Including 36 gas retorts, there were 1,253 ovens in Colorado in 1898, a decrease of 20 from 1897. Of this total 33 were idle, leaving 1,220 ovens producing coke in 1898.

The statistics of the production of coke in Colorado from 1880 to 1898 are given in the following table. From 1892 to 1898, both inclusive, the statements of production of coke in Utah are included in Colorado.

Statistics of the manufacture of coke in Colorado from 1880 to 1898.

Year.	Estab-lish-ments.	Ovens.		Coal used.	Coke pro-duced.	Total value of coke at ovens.	Value of coke at ovens, per ton.	Yield of coal in coke.
		Built.	Build-ing.					
				<i>Short tons.</i>	<i>Short tons.</i>			<i>Per cent.</i>
1880....	1	200	50	51,891	25,568	\$145,226	\$5.68	49
1881....	2	267	0	97,508	48,587	267,156	5.29	50
1882....	5	344	0	180,549	102,105	476,665	4.67	57
1883....	7	352	0	224,089	133,997	584,578	4.36	60
1884....	8	409	24	181,968	115,719	409,930	3.45	64
1885....	7	434	0	208,069	131,960	512,162	3.88	63

Statistics of the manufacture of coke in Colorado from 1880 to 1898—Continued.

Year.	Estab- lish- ments.	Ovens.		Coal used.	Coke pro- duced.	Total value of coke at ovens.	Value of coke at ovens, per ton.	Yield of coal in coke.
		Built.	Build- ing.					
				<i>Short tons.</i>	<i>Short tons.</i>			<i>Per cent.</i>
1886....	7	483	0	228,060	142,797	\$569,120	\$3.99	62.6
1887....	7	532	0	267,487	170,698	682,778	4.00	64
1888....	7	602	100	274,212	179,682	716,305	4.00	65.6
1889....	9	834	50	299,731	187,638	643,479	3.43	63
1890....	8	916	30	407,023	245,756	959,246	3.90	60
1891....	7	948	21	452,749	277,074	896,984	3.24	61
1892a ..	9	b 1,128	220	599,200	c 373,229	1,234,320	3.31	62.3
1893a ..	8	b 1,154	200	628,935	d 362,986	1,137,488	3.13	57.7
1894a ..	8	b 1,154	250	542,429	e 317,196	903,970	2.85	58.5
1895a ..	9	b 1,169	0	580,584	f 340,357	940,987	2.76	58.6
1896a ..	11	b 1,275	0	639,238	g 363,760	1,046,306	2.88	56.9
1897a ..	12	b 1,273	0	616,592	h 342,653	999,216	2.916	55.6
1898a ..	12	b 1,253	3	803,686	i 474,808	1,230,428	2.59	59.8

a Includes production and value of coke in Utah, and of coal coked.

b Includes 36 gas retorts.

c Colorado's coke production, 365,920 tons.

d Colorado's coke production, 346,981 tons.

e Colorado's coke production, 301,140 tons.

f Colorado's coke production, 317,838 tons.

g Colorado's coke production, 343,313 tons.

h Colorado's coke production, 319,036 tons.

i Colorado's coke production, 445,962 tons.

Washing the slack coal before coking has been found to improve the quality and value of the resultant coke, and the amount of washed coal used has steadily increased since washeries were introduced in 1895. Light demand for coke in 1897 caused all of the product to be made from slack coal. Improved conditions in 1898 made it necessary to resume using mine-run coal.

The character of the coal used in the manufacture of coke in Colorado and Utah since 1890 is shown in the following table:

Character of coal used in the manufacture of coke in Colorado and Utah since 1890.

Year.	Run of mine.		Slack.		Total.
	Unwashed.	Washed.	Unwashed.	Washed.	
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
1890.....	36,058	0	395,023	0	431,081
1891.....	93,752	0	384,278	0	478,030
1892.....	82,098	0	517,102	0	599,200
1893.....	109,915	0	519,020	0	628,935
1894.....	126,642	0	415,787	0	542,429
1895.....	119,868	0	453,597	7,119	580,584
1896.....	143,604	0	378,776	116,858	639,238
1897.....	0	0	393,214	223,378	616,592
1898.....	122,983	0	415,298	265,405	803,686

GEORGIA.

Coking in Georgia is an industry of comparatively little importance, and is on the decline. The only coal produced in the State is from the extreme northwestern portion, which is cut by the eastern border of the Appalachian coal field. The coal, as it is mined, is washed before being coked. The amount of coal charged into the ovens is the amount mined, and not the weight of the coal after being washed.

The production in 1898, while showing an increase of 50 per cent over 1897, was not equal to the production in 1896, nor to that of any year previous to that since 1883.

The statistics of the production of coke in Georgia, 1880 to 1898, are as follows:

Statistics of the manufacture of coke in Georgia, 1880 to 1898.

Year.	Estab- lish- ments.	Ovens.		Coal used.	Coke pro- duced.	Total value of coke at ovens.	Value of coke at ovens, per ton.	Yield of coal in coke.
		Built.	Build- ing.					
				<i>Short tons.</i>	<i>Short tons.</i>			<i>Per cent.</i>
1880	1	140	40	63,402	38,041	\$81,789	\$2.15	60
1881	1	180	40	68,960	41,376	88,753	2.15	60
1882	1	220	44	77,670	46,602	100,194	2.15	60
1883	1	264	36	111,687	67,012	147,166	2.20	60
1884	1	300	0	132,113	79,268	169,192	2.13	60
1885	2	300	0	117,781	70,669	144,198	2.04	60
1886	2	300	0	136,133	82,680	179,031	2.17	60
1887	2	300	0	158,482	79,241	174,410	2.20	50
1888	1	290	0	140,000	83,721	177,907	2.12	60
1889	1	300	0	157,878	94,727	149,059	1.57	60
1890	1	300	0	170,388	102,233	150,995	1.48	60
1891	1	300	0	164,875	103,057	231,878	2.25	62.5
1892	1	300	0	158,978	81,807	163,614	2.00	51.5
1893	1	338	0	171,645	90,726	136,089	1.50	52.8
1894	1	338	0	166,523	93,029	116,286	1.25	55.9
1895	1	330	0	118,900	60,212	70,580	1.17	50.6
1896	1	334	0	109,655	53,673	68,486	1.276	49
1897	1	300	0	67,000	33,000	42,240	1.28	49.3
1898	2	350	0	81,108	49,529	77,230	1.56	61

As shown in the following table, all of the coal used in the manufacture of coke in Georgia since 1891 was washed before being coked:

Character of coal used in the manufacture of coke in Georgia since 1890.

Year.	Run of mine.		Slack.		Total.
	Unwashed.	Washed.	Unwashed.	Washed.	
	Short tons.	Short tons.	Short tons.	Short tons.	Short tons.
1890.....	0	0	0	170,388	170,388
1891.....	106,131	0	0	58,744	164,875
1892.....	0	0	0	158,978	158,978
1893.....	0	0	0	171,645	171,645
1894.....	0	166,523	0	0	166,523
1895.....	0	118,900	0	0	118,900
1896.....	0	109,655	0	0	109,655
1897.....	0	67,000	0	0	67,000
1898.....	0	61,844	0	19,264	81,108

ILLINOIS.

The production of coke from Illinois coal continues to be insignificant. Laboratory tests have shown that some of the Illinois coals are true coking coals, but their coking qualities vary greatly and their successful use upon a large scale has not been demonstrated. The impurities in Illinois coals have worked against it in the manufacture of metallurgical coke, and as New River and Pennsylvania cokes can be obtained at reasonable cost in the markets that would be fed by the Illinois product, consumers find it economy to use the superior article.

Statistics of the manufacture of coke in Illinois from 1880 to 1898.

Year.	Estab- lish- ments.	Ovens.		Coal used.	Coke pro- duced.	Total value of coke at ovens.	Value of coke at ovens, per ton.	Yield of coal in coke.
		Built.	Build- ing.					
				Short tons.	Short tons.			Per cent.
1880	6	176	0	31,240	12,700	\$41,950	\$3.30	41
1881	6	176	0	35,240	14,800	45,850	3.10	42
1882	7	304	0	25,270	11,400	29,050	2.55	45
1883	7	316	0	31,170	13,400	28,200	2.10	43
1884	9	325	0	30,168	13,095	25,639	1.96	43
1885	9	320	0	21,487	10,350	27,798	2.68	48
1886	9	335	0	17,806	8,103	21,487	2.65	46
1887	8	278	0	16,596	9,108	19,594	2.13	55.5
1888	8	221	0	13,020	7,410	21,038	2.84	56.9
1889	4	149	0	19,250	11,583	29,764	2.57	60

Statistics of the manufacture of coke in Illinois from 1880 to 1898—Continued.

Year.	Estab- lish- ments.	Ovens.		Coal used.	Coke pro- duced.	Total value of coke at ovens.	Value of coke at ovens, per ton.	Yield of coal in coke.
		Built.	Build- ing.					
				<i>Short tons.</i>	<i>Short tons.</i>			<i>Per cent.</i>
1890	4	148	0	9,000	5,000	\$11,250	\$2.25	55
1891	1	25	0	10,000	5,200	11,700	2.25	52
1892	1	24	0	4,800	3,170	7,133	2.25	66
1893	1	24	0	3,300	2,200	4,400	2.00	66.7
1894	1	24	0	3,800	2,200	4,400	2.00	57.9
1895	3	129	0	3,600	2,250	4,500	2.00	62.5
1896	3	127	0	3,900	2,600	5,200	2.00	66.7
1897	2	126	0	3,591	1,549	2,895	1.87	43
1898	2	126	0	6,650	2,325	4,686	2.02	35

The character of the coal used in the manufacture of coke in Illinois since 1890 is shown in the following table:

Character of coal used in the manufacture of coke in Illinois since 1890.

Year.	Run of mine.		Slack.		Total.
	Unwashed.	Washed.	Unwashed.	Washed.	
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short ton.</i>	<i>Short tons.</i>
1890	0	0	0	9,000	9,000
1891	0	0	10,000	0	10,000
1892	0	0	4,800	0	4,800
1893	0	0	0	3,300	3,300
1894	0	0	0	3,800	3,800
1895	0	0	0	3,600	3,600
1896	0	0	0	3,900	3,900
1897	0	0	3,591	0	3,591
1898	0	0	0	6,650	6,650

INDIANA.

Conditions very similar to those which have discouraged coke making in Illinois prevail in Indiana. Good coking coals exist in the State, but the product obtained is not equal to that of Connellsville, New River, or Pocahontas, any of which can be purchased at very little difference in cost, and consumers prefer to pay the slightly higher price for the superior article. There are only two banks of ovens in the State, and only one of these produced coke in 1897 and 1898. The production of Indiana in 1898 was the smallest on record and the culmination of five years of steadily decreasing output.

The statistics of the manufacture of coke in Indiana from 1886 to 1898, both inclusive, are given in the following table:

Statistics of the manufacture of coke in Indiana from 1886 to 1898.

Year.	Estab-lish-ments.	Ovens.		Coal used.	Coke pro-duced.	Total value of coke at ovens.	Value of coke at ovens, per ton.	Yield of coal in coke.
		Built.	Build-ing.					
				<i>Short tons.</i>	<i>Short tons.</i>			<i>Per cent.</i>
1886	4	100	18	13,030	6,124	\$17,953	\$2.93	47
1887	4	119	0	35,600	17,658	51,141	2.81	50
1888	3	103	0	26,547	11,956	31,993	2.68	45
1889	4	111	0	16,428	8,301	25,922	3.12	51
1890	4	101	0	11,753	6,013	19,706	3.28	51
1891	2	84	0	8,688	3,798	7,596	2.00	44
1892	2	84	0	6,456	3,207	6,472	2.02	49.7
1893	2	94	0	11,549	5,724	9,048	1.58	49.6
1894	2	94	0	13,489	6,551	13,102	2.00	48.6
1895	2	94	0	9,898	4,804	9,333	1.94	48.5
1896	2	94	0	8,956	4,353	8,647	1.99	49
1897	2	94	0	7,022	2,904	5,795	1.995	41.4
1898	2	94	0	4,065	1,825	3,194	1.75	44.9

All of the coal made into coke in Indiana is slack, and since 1895 all of this has been washed as shown in the following table:

Character of coal used in the manufacture of coke in Indiana since 1890.

Year.	Run of mine.		Slack.		Total.
	Unwashed.	Washed.	Unwashed.	Washed.	
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
1890	0	0	0	11,753	11,753
1891	0	0	0	8,688	8,688
1892	0	0	0	6,456	6,456
1893	0	0	930	10,619	11,549
1894	0	0	8,689	4,800	13,489
1895	0	0	0	9,898	9,898
1896	0	0	0	8,956	8,956
1897	0	0	0	7,022	7,022
1898	0	0	0	4,065	4,065

INDIAN TERRITORY.

While the coking industry in the Territory is still a small one, the production has increased steadily since 1894. Most of the coal used is slack purchased from the mining companies, and this does not appear in the amount made into coke as given in the chapter on coal production. All of the coal is washed before charging the ovens.

The statistics of the manufacture of coke in the Indian Territory from 1880 to 1898 are as follows:

Statistics of the manufacture of coke in the Indian Territory from 1880 to 1898.

Year.	Estab- lish- ments.	Ovens.		Coal used.	Coke pro- duced.	Total value of coke at ovens.	Value of coke at ovens, per ton.	Yield of coal in coke.
		Built.	Build- ing.					
				<i>Short tons.</i>	<i>Short tons.</i>			<i>Per cent.</i>
1880	1	20	0	2,494	1,546	\$4,638	\$3.00	62
1881	1	20	0	2,852	1,768	5,304	3.00	62
1882	1	20	0	3,266	2,025	6,075	3.00	62
1883	1	20	0	4,150	2,573	7,719	3.00	62
1884	1	20	0	3,084	1,912	5,736	3.00	62
1885	1	40	0	5,781	3,584	12,902	3.60	62
1886	1	40	0	10,242	6,351	22,229	3.30	62
1887	1	80	0	20,121	10,060	33,435	3.33	50
1888	1	80	0	13,126	7,502	21,755	2.90	57
1889	1	78	0	13,277	6,639	17,957	2.70	50
1890	1	78	0	13,278	6,639	21,577	3.25	50
1891	1	80	0	20,551	9,464	30,483	3.22	46
1892	1	80	0	7,138	3,569	12,402	3.47	50
1893	1	80	0	15,118	7,135	25,072	3.51	47
1894	1	80	0	7,274	3,051	10,693	3.50	42
1895	1	80	0	11,825	5,175	17,657	3.41	43.8
1896	2	130	0	53,028	21,021	73,574	3.50	40
1897	2	130	0	68,495	30,364	104,725	3.45	44.3
1898	2	130	0	73,330	34,110	96,639	2.833	46.5

The character of the coal used in the manufacture of coke in the Indian Territory since 1890 is shown in the following table:

Character of coal used in the manufacture of coke in the Indian Territory since 1890.

Year.	Run of mine.		Slack.		Total.
	Unwashed.	Washed.	Unwashed.	Washed.	
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
1890	0	0	0	13,278	13,278
1891	0	0	9,500	11,051	20,551
1892	0	0	0	7,138	7,138
1893	0	0	0	15,118	15,118
1894	0	0	0	7,274	7,274
1895	0	0	0	11,825	11,825
1896	0	0	0	53,028	53,028
1897	0	6,923	0	61,572	68,495
1898	0	15,353	0	57,977	73,330

KANSAS.

The coke industry of Kansas is only of local importance, the production of coke in this State being chiefly for domestic purposes and the smelting of lead and zinc. Most of the coke produced in the State is made by the lead and zinc smelters for their own use.

As will be seen in the following table, 50 new ovens were in course of construction in December, 1898. These ovens are located at Lowell, Cherokee County, and are being built by the Eastern Coal and Coke Co. If successful with these the company will increase its plant to 200 ovens.

The statistics of the manufacture of coke in Kansas from 1880 to 1898 are as follows:

Statistics of the manufacture of coke in Kansas from 1880 to 1898.

Year.	Estab- lish- ments.	Ovens.		Coal used.	Coke pro- duced.	Total value of coke at ovens.	Value of coke at ovens per ton.	Yield of coal in coke.
		Built.	Build- ing.					
				<i>Short tons.</i>	<i>Short tons.</i>			<i>Per cent.</i>
1880	2	6	.....	4,800	3,070	\$6,000	\$1.95	64
1881	3	15	.....	8,800	5,670	10,200	1.80	64.4
1882	3	20	.....	9,200	6,080	11,460	1.70	66
1883	4	23	.....	13,400	8,430	16,560	1.96	62.9
1884	4	23	.....	11,500	7,190	14,580	2.02	62.5
1885	4	23	.....	15,000	8,050	13,255	1.65	53.7
1886	4	36	.....	23,062	12,493	19,204	1.54	54.2
1887	4	39	.....	27,604	14,950	28,575	1.91	54
1888	6	58	.....	24,934	14,831	29,073	1.96	59.5
1889	6	68	.....	21,600	13,910	26,593	1.91	64
1890	7	68	.....	21,809	12,311	29,116	2.37	56
1891	6	72	.....	27,181	14,174	33,296	2.35	52
1892	6	75	.....	15,437	9,132	19,906	2.18	59.2
1893	6	75	0	13,645	8,565	18,640	2.18	62.8
1894	6	61	0	13,288	8,439	15,660	1.855	63.5
1895	5	55	0	8,424	5,287	11,289	2.14	62.8
1896	6	55	0	8,940	4,785	8,676	1.813	53.5
1897	4	57	0	11,772	6,181	9,272	1.50	52.5
1898	6	47	50	7,856	4,180	6,455	1.545	53

The character of the coal used in the manufacture of coke in Kansas since 1890 is shown in the following table:

Character of coal used in the manufacture of coke in Kansas since 1890.

Year.	Run of mine.		Slack.		Total.
	Unwashed.	Washed.	Unwashed.	Washed.	
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	
1890.....	0	0	19,619	2,190	21,809
1891.....	0	0	27,181	0	27,181
1892.....	0	0	15,437	0	15,437
1893.....	0	0	12,445	1,200	13,645
1894.....	0	0	13,288	0	13,288
1895.....	0	0	8,424	0	8,424
1896.....	0	0	8,940	0	8,940
1897.....	0	0	11,772	0	11,772
1898.....	0	0	7,856	0	7,856

KENTUCKY.

The production of coke in Kentucky fell off somewhat in 1898, although 24 new ovens were added to its equipment in that year. It is probable that the increased demand for coal in western Kentucky discouraged coke making. Of the 292 ovens in the State more than half (150) were idle in 1898, against 50 idle in 1897.

The statistics of the manufacture of coke in Kentucky from 1880 to 1898 are as follows:

Statistics of the manufacture of coke in Kentucky from 1880 to 1898.

Year.	Estab-lish-ments.	Ovens.		Coal used.	Coke pro-duced.	Total value of coke at ovens.	Value of coke at ovens, per ton.	Yield of coal in coke.
		Built.	Build-ing.					
				<i>Short tons.</i>	<i>Short tons.</i>			<i>Per cent.</i>
1880.....	5	45	.....	7,206	4,250	\$12,250	\$2.88	59
1881.....	5	45	.....	7,406	4,370	12,630	2.89	59
1882.....	5	45	.....	6,906	4,070	11,530	2.83	59
1883.....	5	45	.....	8,437	5,025	14,425	2.87	60
1884.....	5	45	.....	3,451	2,223	8,760	3.94	64
1885.....	5	33	.....	5,075	2,704	8,489	3.14	53
1886.....	6	76	2	9,055	4,528	10,082	2.23	50
1887.....	6	98	.....	29,129	14,565	31,730	2.18	50
1888.....	10	132	2	42,642	23,150	47,244	2.04	54
1889.....	9	166	100	25,192	13,021	29,769	2.28	52
1890.....	9	175	303	24,372	12,343	22,191	1.80	51
1891.....	7	115	24	64,390	33,777	68,281	2.02	52
1892.....	5	287	100	70,783	36,123	72,563	2.01	51
1893.....	4	283	100	97,212	48,619	97,350	2.00	50
1894.....	6	293	0	66,418	29,748	51,566	1.73	44.8
1895.....	5	293	0	63,419	25,460	37,249	1.46	40.1
1896.....	4	264	0	55,719	27,107	42,062	1.55	48.6
1897.....	5	268	0	64,234	32,117	45,454	1.41	50
1898.....	5	292	2	44,484	22,242	32,213	1.448	50

The character of the coal used in the manufacture of coke in Kentucky since 1890 is shown in the following table:

Character of coal used in the manufacture of coke in Kentucky since 1890.

Year.	Run of mine.		Slack.		Total.
	Unwashed.	Washed.	Unwashed.	Washed.	
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
1890.....	0	3,000	2,100	19,272	24,372
1891.....	11,000	0	3,500	49,890	64,390
1892.....	0	5,955	7,883	56,945	70,783
1893.....	825	11,973	26,759	57,655	97,212
1894.....	0	2,980	7,900	55,538	66,418
1895.....	0	502	624	62,293	63,419
1896.....	16,271	0	0	39,448	55,719
1897.....	4,176	0	0	60,058	64,234
1898.....	0	1,800	0	42,684	44,484

MISSOURI.

Seven of the 15 ovens in the State were abandoned in 1898, and only 6 of the remaining 8 were in operation. As a result, the production, small at best, fell off to 740 short tons, less than one-third of the output in 1897 or 1896.

The statistics of the production of coke in Missouri from 1887, when coking began in this State, to 1898 are as follows:

Statistics of the manufacture of coke in Missouri from 1887 to 1898.

Year.	Estab-lish-ments.	Ovens.		Coal used.	Coke pro-duced.	Total value of coke at ovens.	Value of coke at ovens, per ton.	Yield of coal in coke.
		Built.	Build-ing.					
				<i>Short tons.</i>	<i>Short tons.</i>			<i>Per cent.</i>
1887.....	1	4	.....	5,400	2,970	\$10,395	\$3.50	55
1888.....	1	4	.....	5,000	2,600	9,100	3.50	52
1889.....	3	9	.....	8,485	5,275	5,800	1.10	62
1890.....	3	10	.....	9,491	6,136	9,240	1.51	65
1891.....	3	10	.....	10,377	6,872	10,000	1.45	66
1892.....	3	10	.....	11,088	7,299	10,949	1.50	65.8
1893.....	3	10	0	8,875	5,905	9,736	1.65	66.5
1894.....	3	10	0	3,442	2,250	3,563	1.58	65.4
1895.....	3	10	0	3,120	2,028	2,442	1.20	65
1896.....	3	7	0	4,471	2,500	4,131	1.65	55.9
1897.....	3	15	0	4,627	2,593	3,890	1.50	56
1898.....	3	8	0	1,500	740	1,050	1.42	49.3

The character of the coal used for coke in Missouri since 1890 is shown in the following table:

Character of coal used in the manufacture of coke in Missouri since 1890.

Year.	Run of mine.		Slack.		Total.
	Unwashed.	Washed.	Unwashed.	Washed.	
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
1890.....	0	0	9,491	0	9,491
1891.....	0	0	10,377	0	10,377
1892.....	0	0	11,088	0	11,088
1893.....	0	0	8,875	0	8,875
1894.....	0	0	3,442	0	3,442
1895.....	0	0	3,120	0	3,120
1896.....	0	0	4,471	0	4,471
1897.....	0	0	4,627	0	4,627
1898.....	0	0	1,500	0	1,500

MONTANA.

The coal-washing plant of the Anaconda Copper Mining Company was destroyed by fire in April and produced no coke after that date. Another plant having 100 ovens was idle throughout the year, and as a consequence the production which had been steadily increasing for several years fell off about 23 per cent. One new plant of 15 ovens was erected during the year.

The statistics of the manufacture of coke in Montana from 1883, when ovens were first reported, to 1898, are as follows:

Statistics of the manufacture of coke in Montana from 1883 to 1898.

Year.	Estab-lish-ments.	Ovens.		Coal used.	Coke pro-duced.	Total value of coke at ovens.	Value of coke at ovens, per ton.	Yield of coal in coke.
		Built.	Build-ing.					
				<i>Short tons.</i>	<i>Short tons.</i>			<i>Per cent.</i>
1883	1	2	0	0	0	0	0	0
1884	3	5	12	165	75	\$900	\$12.00	46
1885	2	2	0	300	175	2,063	11.72	58.5
1886	4	16	0	0	0	0	0	0
1887	2	27	0	10,800	7,200	72,000	10.00	66½
1888	1	40	0	20,000	12,000	96,000	8.00	60
1889	2	90	50	30,576	14,043	122,023	8.69	46
1890	2	140	0	32,148	14,427	125,655	8.71	45
1891	2	140	0	61,667	29,009	258,523	8.91	47
1892	2	153	0	64,412	34,557	311,013	9.00	53.6
1893	2	153	0	61,770	29,945	239,560	8.00	48.5
1894	2	153	0	33,313	17,388	165,187	9.50	52.2
1895	3	303	0	55,770	25,337	189,856	7.49	45.4
1896	3	303	0	113,165	60,078	425,483	7.08	53
1897	3	303	0	139,907	67,849	467,481	6.89	48.5
1898	4	318	0	92,552	52,009	359,174	6.91	56

The character of the coal used in the manufacture of coke in Montana since 1890 is shown in the following table:

Character of coal used in the manufacture of coke in Montana.

Year.	Run of mine.		Slack.		Total.
	Unwashed.	Washed.	Unwashed.	Washed.	
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
1890.....	0	22,852	0	9,296	32,148
1891.....	0	34,000	0	27,667	61,667
1892.....	0	28,000	0	36,412	64,412
1893.....	0	44,000	0	17,770	61,770
1894.....	0	33,313	0	0	33,313
1895.....	0	0	0	55,770	55,770
1896.....	0	50,000	0	63,165	113,165
1897.....	0	75,000	0	64,907	139,907
1898.....	12,000	60,000	0	20,552	92,552

NEW MEXICO.

The washer for the new bank of 76 ovens, built in 1897 by the Raton Coal and Coke Company, at Gardiner, was destroyed by fire in December, and no coke was made at the plant. The Colorado Fuel and Iron Company built 64 new ovens at Blossburg, which produced some coke in 1898. All of the ovens will be operated in 1899, and a considerable increase in production is anticipated.

The statistics of the production of coke in New Mexico from 1882, when coke ovens were first reported, until 1898 are as follows:

Statistics of the manufacture of coke in New Mexico from 1882 to 1898.

Year.	Estab- lish- ments.	Ovens.		Coal used.	Coke pro- duced.	Total value of coke at ovens.	Value of coke at ovens, per ton.	Yield of coal in coke.
		Built.	Build- ing.					
				<i>Short tons.</i>	<i>Short tons.</i>			<i>Per cent.</i>
1882.....	2	0	12	1,500	1,000	\$6,000	\$6.00	66½
1883.....	2	12	28	6,941	3,905	21,478	5.50	57½
1884.....	2	70	0	29,990	18,282	91,410	5.00	57½
1885.....	2	70	0	31,889	17,940	89,700	5.00	56½
1886.....	2	70	0	18,194	10,236	51,180	5.00	56
1887.....	1	70	0	22,549	13,710	82,260	6.00	61
1888.....	1	70	0	14,628	8,540	51,240	6.00	58
1889.....	2	70	0	7,162	3,460	18,408	5.32	48
1890.....	2	70	0	3,980	2,050	10,025	4.89	51.5
1891.....	1	70	0	4,000	2,300	10,925	4.75	57.5
1892.....	1	50	0	0	0	0	0	0
1893.....	1	50	0	14,698	5,803	18,476	3.18	39.5
1894.....	1	50	0	13,042	6,529	28,213	4.32	50
1895.....	1	50	0	22,385	14,663	29,491	2.01	65.5
1896.....	1	50	0	39,286	24,228	48,453	2.00	61.7
1897.....	2	126	0	2,585	1,438	3,232	2.25	55.6
1898.....	3	190	0	12,557	6,980	14,625	2.095	55.6

The character of the coal used in the manufacture of coke in New Mexico since 1890 is shown in the following table:

Character of coal used in the manufacture of coke in New Mexico since 1890.

Year.	Run of mine.		Slack.		Total.
	Unwashed.	Washed.	Unwashed.	Washed.	
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
1890.....	3,980	0	0	0	3,980
1891.....	4,000	0	0	0	4,000
1892.....	0	0	0	0	0
1893.....	14,698	0	0	0	14,698
1894.....	0	0	13,042	0	13,042
1895.....					22,385
1896.....	0	0	39,286	0	39,286
1897.....	0	0	2,585	0	2,585
1898.....	0	0	12,557	0	12,557

NEW YORK.

The production of coke at Syracuse, New York, is included in that of Pennsylvania, from whose fields the coal is drawn, permission to publish the New York production having been withheld in the last three years, and the reports have been furnished the Survey with the understanding that they would not be divulged.

Statistics of the manufacture of coke in New York.

	1893.	1894.	1895.	1896.	1897.	1898.
Establishments.....	1	1	1	1	1	1
Ovens built.....	12	12	12	25	25	25
Ovens building.....	13	13	13	0	0	0
Coke produced... tons..	12,850	16,500	18,521			
Coal used.....do...	15,150		22,207			
Yield of coal in coke, per cent.....	84.8		83.4			

OHIO.

Notwithstanding the large consumption of coke in Ohio and the large fields of coking coals in the State, the coking industry is of slight importance. This is doubtless due to the same cause that obtains in Illinois and Indiana, the proximity of the Connellsville, New River, and Pocahontas fields, and the cheapness with which these cokes can be procured.

In previous reports of Mineral Resources the State has been divided into two coke-producing districts, called the Ohio and the Cincinnati. This division is continued in the present chapter. Two establishments, having 175 ovens, in the Cherry Valley iron district are included in the Ohio coke district.

The coke production of the State in 1897 was the largest in fifteen years, most of the increase being in the Cincinnati district. A decrease of 10 per cent is observed in the production of 1898, and most of the decrease was also in the Cincinnati district.

In the following table the statistics of the production of coke in the two districts of Ohio for the years 1880 to 1898 are consolidated.

Statistics of the manufacture of coke in Ohio from 1880 to 1898.

Year.	Estab- lish- ments.	Ovens.		Coal used.	Coke pro- duced.	Total value of coke at ovens.	Value of coke at ovens, per ton.	Yield of coal in coke.
		Built.	Build- ing.					
				<i>Short tons.</i>	<i>Short tons.</i>			<i>Per cent.</i>
1880	15	616	25	172,453	100,596	\$255,905	\$2.54	58
1881	15	641	0	201,045	119,469	297,728	2.49	59
1882	16	647	0	181,577	103,722	266,113	2.57	57
1883	18	682	0	152,502	87,834	225,660	2.57	58
1884	19	732	0	108,164	62,709	156,294	2.49	58
1885	13	642	0	68,796	39,416	109,723	2.78	57
1886	15	560	0	59,332	34,932	94,042	2.69	59
1887	15	585	223	164,974	93,004	245,981	2.65	56
1888	15	547	12	124,201	67,194	166,330	2.48	54
1889	13	462	0	132,828	75,124	188,222	2.50	56
1890	13	443	1	126,921	74,633	218,090	2.92	59
1891	9	421	0	69,320	38,718	76,901	1.99	56
1892	10	436	0	95,236	51,818	112,907	2.18	54.4
1893	9	435	0	42,963	22,436	43,671	1.95	52
1894	8	363	0	55,324	32,640	90,875	2.78	59
1895	8	377	0	51,921	29,050	69,655	2.40	56
1896	9	431	0	128,923	80,868	208,789	2.58	62.7
1897	9	433	0	151,545	95,087	235,784	2.48	62.7
1898	10	441	0	134,757	85,535	211,558	2.47	63.5

Cincinnati district.—All the coke made in this district is from the dust and screenings of the coal yards at Cincinnati and from the coal boats and barges that bring coal from the Upper Ohio, chiefly from the Pittsburg and the Kanawha regions of West Virginia. When the ovens are in operation, some run of mine and slack from Pittsburg mines is used in the North Bend block of ovens, situated on the Ohio River a short distance below Cincinnati.

The statistics of the manufacture of coke in the Cincinnati district from 1880 to 1898 are as follows:

Statistics of the manufacture of coke in the Cincinnati district, Ohio, from 1880 to 1898.

Year.	Estab- lish- ments.	Ovens.		Coal used.	Coke pro- duced.	Total value of coke at ovens.	Value of coke at ovens, per ton.	Yield of coal in coke.
		Built.	Build- ing.					
				Short tons.	Short tons.			Per cent.
1880	4	32	0	16, 141	10, 326	\$42, 255	\$4. 09	64
1881	4	32	0	20, 607	13, 237	54, 439	4. 11	64
1882	4	32	0	19, 687	12, 045	47, 437	3. 78	61
1883	5	57	0	33, 978	20, 106	65, 990	3. 28	59
1884	5	57	0	32, 134	18, 840	61, 072	3. 24	59
1885	5	82	0	17, 480	10, 962	35, 873	3. 27	63
1886	5	82	0	17, 015	10, 566	31, 633	2. 99	62. 1
1887	5	150	20	56, 723	32, 894	95, 754	2. 91	58
1888	6	156	12	63, 217	35, 868	95, 618	2. 67	57
1889	5	146	0	75, 892	45, 108	120, 899	2. 68	59. 4
1890	5	150	0	68, 266	43, 278	171, 848	3. 97	63
1891	3	130	0	13, 403	9, 080	31, 529	3. 47	67. 7
1892	4	146	0	31, 330	19, 320	64, 319	3. 33	61. 3
1893	3	142	0	13, 700	9, 000	27, 000	3. 00	65. 7
1894	3	92	0	42, 995	26, 417	81, 751	3. 09	61
1895	3	92	0	9, 628	5, 657	16, 971	3. 00	58. 8
1896	3	92	0	16, 495	10, 181	31, 068	3. 05	61. 7
1897	3	92	0	40, 200	23, 532	67, 079	2. 85	59
1898	3	92	0	27, 451	16, 329	46, 179	2. 828	59. 5

Ohio district.—The district, as noted above, includes all of the ovens coking Ohio coal and the ovens at Leetonia, in Columbiana County, and in the vicinity of Steubenville and Bridgeport, which latter place is opposite Wheeling, West Virginia. It also includes 125 ovens of the Marietta Run Coal and Coke Company and 50 ovens of the Black Diamond Coal and Coke Company in the Federal Valley district.

Statistics of the manufacture of coke in the Ohio district, Ohio, from 1880 to 1898.

Year.	Estab- lish- ments.	Ovens.		Coal used.	Coke pro- duced.	Total value of coke at ovens.	Value of coke at ovens, per ton.	Yield of coal in coke.
		Built.	Build- ing.					
				<i>Short tons.</i>	<i>Short tons.</i>			<i>Per cent.</i>
1880	11	584	25	156,312	90,270	\$213,650	\$2.37	57
1881	11	609	0	180,438	106,232	243,289	2.39	59
1882	12	615	0	161,890	91,677	218,676	2.39	57
1883	13	625	0	118,524	67,728	459,670	2.36	57
1884	14	675	0	76,030	43,869	95,222	2.17	58
1885	8	560	0	51,316	28,454	73,850	2.60	55
1886	10	478	0	42,317	24,366	62,409	2.56	57½
1887	10	435	203	108,251	60,110	150,227	2.50	55½
1888	9	391	0	60,984	31,326	70,712	2.25	51
1889	8	316	0	56,936	30,016	67,323	2.24	52.7
1890	8	293	1	58,655	31,335	46,242	1.47	53.4
1891	6	291	0	55,917	29,638	45,372	1.53	53
1892	6	290	0	63,906	32,498	48,588	1.50	50.9
1893	6	293	0	29,263	13,436	16,671	1.24	46
1894	5	271	0	12,329	6,223	9,124	1.466	50.5
1895	5	285	0	42,293	23,393	52,684	2.25	55.3
1896	6	339	0	112,428	70,687	177,721	2.51	62.8
1897	6	341	0	111,345	71,555	168,705	2.36	64
1898	7	349	0	107,306	69,206	165,379	2.39	64.5

The character of the coal used in the manufacture of coke in Ohio since 1890 is shown in the following table:

Character of coal used in the manufacture of coke in Ohio since 1890.

Year.	Run of mine.		Slack.		Total.
	Unwashed.	Washed.	Unwashed.	Washed.	
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
1890	34,729	0	54,473	37,719	126,921
1891	5,200	0	64,120	0	69,320
1892	35,334	0	32,402	27,500	95,236
1893	0	0	24,859	18,104	42,963
1894	0	0	14,845	40,479	55,324
1895	28,053	0	10,868	13,000	51,921
1896	88,616	0	24,325	15,982	128,923
1897	92,192	0	29,353	30,000	151,545
1898	92,963	0	19,794	22,000	134,757

PENNSYLVANIA.

The coking districts of Pennsylvania have been so frequently described in previous volumes of Mineral Resources that it is not necessary to enter into any details regarding them. As it is important, however, that the dividing line between these districts should be kept in mind in examining these statistics, the following brief statement as to the territory included in these districts, which has been published in previous reports, is repeated here for the sake of convenience.

The Allegheny Mountain district includes the ovens along the line of the Pennsylvania Railroad from Gallitzin eastward over the crest of the Alleghenies to beyond Altoona. The Allegheny Valley district includes the coke works of Armstrong and Butler counties and one of those in Clarion County, the other ovens in the latter county being included in the Reynoldsville-Walston district. The Beaver district includes the ovens in Beaver and Mercer counties; the Blossburg and Broad Top, those in the Blossburg and Broad Top coal fields. The ovens of the Clearfield-Center district are chiefly in the two counties from which it derives its name. The Connellsville district is the well-known region in western Pennsylvania, in Westmoreland and Fayette counties, extending from just south of Latrobe to Fairchance. The Greensburg, Irwin, Pittsburg, and Reynoldsville-Walston districts include the ovens near the towns which have given the names to these districts. The Upper Connellsville district, sometimes called the Latrobe district, is near the town of Latrobe.

The Allegheny Valley district produced no coke in 1898, all the ovens being idle for the fourth time in its history. All of the ovens in Beaver County (in the Beaver district) were abandoned in 1898, and the operations of the 25 Semet-Solvay ovens in Mercer County have been included in the Pittsburg district.

The production of coke in Pennsylvania in 1898 amounted to 10,715,302 short tons, a gain of 1,748,378 short tons, or 19.5 per cent, over 1897, and of 1,311,087 short tons, or 14 per cent, over the product of 1895, which prior to 1898 was the year of maximum production. Of the total increase in 1898 over 1897, 1,454,524 short tons was in the increased output of the Connellsville district. And of the total production in the State nearly 80 per cent, or 8,315,350 short tons, was from this famous coke-producing region. This district, all of which is contained in the two counties of Fayette and Westmoreland, produces annually more than 50 per cent of the total coke output of the United States.

The total number of ovens in the State in 1898 shows a net increase of 247 over 1897. Of the 27,157 ovens in existence 1,531 were idle throughout the entire year. It is possible that the number of idle ovens may be understated, for some of the larger operators make only one report for all the ovens in a certain district, and some of the ovens

included in the report may have been out of blast. There were, however, 17 separate establishments, whose aggregate number of ovens was 1,103, which were idle throughout the year. The largest number in any one establishment was 200, and 4 had between 100 and 150 each, by which it can be seen that nearly all of the idle establishments were comparatively small concerns. All of the 17 were outside of the Connellsville region. Notwithstanding the fact that the demand for coke was active throughout the greater part of the year, there was a slight decline in the average price. As the increased cost of the augmented product in 1898 was largely confined to the cost of the extra amount of coal used, the slightly reduced prices were probably as remunerative as those of 1897.

In the following table the statistics are given of the production of coke in Pennsylvania for the years 1880 to 1898:

Statistics of the manufacture of coke in Pennsylvania from 1880 to 1898.

Year.	Estab- lish- ments.	Ovens.		Coal used.	Coke pro- duced.	Total value of coke at ovens.	Value of coke at ovens, per ton.	Yield of coal in coke.
		Built.	Build- ing.					
				<i>Short tons.</i>	<i>Short tons.</i>			<i>Per cent.</i>
1880..	124	9,501	836	4,347,558	2,821,384	\$5,255,040	\$1.86	65
1881..	132	10,881	761	5,393,503	3,437,708	5,898,579	1.70	64
1882..	137	12,424	642	6,149,179	3,945,034	6,133,698	1.55	64
1883..	140	13,610	211	6,823,275	4,438,464	5,410,387	1.22	65
1884..	145	14,285	232	6,204,604	3,822,128	4,783,230	1.25	62
1885..	133	14,553	317	6,178,500	3,991,805	4,981,656	1.25	64.6
1886..	108	16,314	2,558	8,290,849	5,406,597	7,664,023	1.42	65.2
1887..	151	18,294	802	8,938,438	5,832,849	10,746,352	1.84	65.3
1888..	120	20,381	1,565	9,673,097	6,545,779	8,230,759	1.26	68
1889..	109	22,143	567	11,581,292	7,659,055	10,743,492	1.40	66
1890..	106	23,430	74	13,046,143	8,560,245	16,333,674	1.91	65.6
1891..	109	25,324	11	10,588,544	6,954,846	12,679,826	1.82	66
1892..	109	25,366	269	12,591,345	8,327,612	15,015,336	1.80	66.1
1893..	102	25,744	19	9,386,702	6,229,051	9,468,036	1.52	66
1894..	101	25,824	118	9,059,118	6,063,777	6,585,489	1.086	66.9
1895..	99	26,042	170	14,211,567	9,404,215	11,908,162	1.266	66.2
1896 ^a .	158	26,658	154	11,124,610	7,356,502	13,182,859	1.792	66.1
1897 ^a .	153	26,910	307	13,538,646	8,966,924	13,727,966	1.53	66.2
1898 ^a .	151	27,157	292	16,307,841	10,715,302	16,078,505	1.50	65.7

^a Includes coal used, coke produced, and its value in New York.

The quality of the coal produced in the principal coking regions of Pennsylvania is such that little or no preparation is necessary before charging into the ovens. For this reason it is found that by far the larger portion of the coal used in the manufacture of coke in Pennsylvania is unwashed; generally from 80 to 90 per cent of the coal coked being unwashed run of mine. There was more coal washed in 1898 than ever before, both in amount and percentage. In 1896 the amount of washed coal, including run of mine and slack, was only 372,474 tons, or about 3.5 per cent of the total. In 1897 the amount of washed coal was 556,576 tons, a little over 4 per cent of the total, while in 1898 the washed coal amounted to 752,421 tons, 4½ per cent of the total.

The character of the coal used in the manufacture of coke in Pennsylvania since 1890 is shown in the following table:

Character of coal used in the manufacture of coke in Pennsylvania since 1890.

Year.	Run of mine.		Slack.		Total.
	Unwashed.	Washed.	Unwashed.	Washed.	
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
1890	11,788,625	303,591	630,195	323,732	13,046,143
1891	9,470,646	256,807	558,106	302,985	10,588,544
1892	11,237,253	159,698	1,059,994	134,400	12,591,345
1893	8,302,307	216,762	739,128	128,505	9,386,702
1894	8,671,534	118,279	204,811	64,494	9,059,118
1895	13,618,376	34,728	440,869	117,594	14,211,567
1896 <i>a</i>	9,289,089	273,082	1,463,047	99,392	11,124,610
1897 <i>a</i>	11,540,459	301,052	1,441,611	255,524	13,538,646
1898 <i>a</i>	14,063,073	350,153	1,472,347	402,268	16,307,841

a Includes coal used in New York.

PRODUCTION, BY DISTRICTS.

In the following tables is presented in detail the statistics of production in Pennsylvania, by districts. It has been necessary to drop two districts from the list—the Allegheny Valley and the Beaver. All of the ovens in the former were idle in 1898, and as only 1 establishment in the Beaver district was in operation, it has been necessary to include it with the Pittsburgh district. In all the other districts, except the Clearfield-Center, production increased in 1898.

Coke production in Pennsylvania in 1898, by districts.

District.	Estab-lish-ments.	Ovens.		Coal used.	Coke pro-duced.	Total value of coke at ovens.	Aver-age price per ton.	Yield of coal in coke.
		Built.	Build-ing.					
Allegheny Moun-tain	13	a 1, 158	b 100	Short tons. 572, 568	Short tons. 378, 410	\$511, 202	\$1. 35	Per ct. 66
Allegheny Valley	2	116	0	0	0	0	0	0
Broad Top	5	500	4	122, 820	80, 935	124, 882	1. 543	65. 9
Clearfield-Center	7	668	0	215, 208	137, 265	195, 836	1. 43	63. 8
Connellsville	88	c 18, 927	20	12, 454, 969	8, 315, 350	12, 626, 292	1. 518	66. 8
Greensburg	3	218	0	112, 487	64, 295	96, 443	1. 50	57
Irwin	5	696	0	332, 368	183, 176	239, 583	1. 308	55
Pittsburg	10	d 1, 100	168	836, 948	552, 742	899, 537	1. 627	66
Reynoldsville-Walston e.....	5	1, 942	0	1, 022, 196	600, 084	846, 121	1. 41	58. 7
Upper Connells-ville	13	f 1, 832	0	638, 277	403, 045	538, 609	1. 34	63
Total	151	27, 157	292	16, 307, 841	10, 715, 302	16, 078, 505	1. 50	65. 7

a Includes 60 Otto-Hoffmann ovens.

c Includes 50 Semet-Solvay ovens.

b Otto-Hoffmann ovens.

d Includes 120 Otto-Hoffmann and 25 Semet-Solvay ovens.

e Includes production of coke and its value in New York.

f Includes 30 Newton-Chambers by-product ovens.

Coke production in Pennsylvania in 1897, by districts.

District.	Estab-lish-ments.	Ovens.		Coal used.	Coke pro-duced.	Total value of coke at ovens.	Aver-age price per ton.	Yield of coal in coke.
		Built.	Build-ing.					
Allegheny Moun-tain	13	a 1, 185	0	Short tons. 417, 470	Short tons. 278, 578	\$365, 191	\$1. 31	Per ct. 66. 7
Allegheny Valley	2	116	0	8, 300	5, 000	10, 000	2. 00	60. 2
Beaver	3	b 33	0	42, 200	27, 276	61, 646	2. 26	64. 6
Broadtop	5	491	15	106, 706	66, 949	107, 430	1. 60	62. 7
Clearfield-Center	7	668	0	230, 395	153, 517	197, 139	1. 28	66
Connellsville	86	c 18, 467	92	10, 243, 690	6, 860, 826	10, 662, 428	1. 55	67
Greensburg	3	178	0	81, 927	52, 495	65, 619	1. 25	64
Irwin	5	696	0	207, 704	136, 663	189, 869	1. 39	65. 8
Pittsburg	9	d 1, 233	200	832, 505	548, 981	864, 326	1. 57	66
Reynoldsville-Walston (e)	6	1, 980	0	810, 808	491, 267	759, 609	1. 55	60. 6
Upper Connells-ville	14	f 1, 863	0	556, 941	345, 372	444, 709	1. 29	62
Total	153	26, 910	307	13, 538, 646	8, 966, 924	13, 727, 966	1. 53	66. 2

a Includes 60 Otto-Hoffmann ovens.

c Includes 50 Semet-Solvay ovens.

b Includes 25 Semet-Solvay ovens.

d Includes 120 Otto-Hoffmann ovens.

e Includes production and value of coal and coke in New York.

f Includes 30 Newton-Chambers and 3 Slocum ovens.

Coke production in Pennsylvania in 1896, by districts.

District.	Estab- lish- ments.	Ovens.		Coal used.	Coke pro- duced.	Total value of coke at ovens.	Aver- age price per ton.	Yield of coal in coke.
		Built.	Build- ing.					
Allegheny Moun- tain	13	^a 1,188	0	408,827	266,473	\$349,373	\$1.31	65
Allegheny Valley	2	116	0	12,445	7,467	14,934	2.00	60
Beaver	3	^b 35	0	13,845	9,004	17,200	1.91	65
Broadtop	5	480	0	111,145	72,175	126,306	1.75	64.9
Clearfield-Center	7	666	0	183,056	118,135	164,266	1.39	64.5
Connellsville	88	^c 18,347	0	8,107,536	5,462,490	10,018,916	1.834	67.4
Greensburg	3	178	0	36,963	24,642	30,928	1.255	66.7
Irwin	5	669	0	279,104	175,916	275,518	1.566	63
Pittsburg	11	1,264	^d 120	583,984	368,070	941,076	2.56	63
Reynoldsville- Walston (^e)	7	1,852	34	770,104	445,998	673,625	1.51	57.9
Upper Connells- ville	14	^f 1,863	0	617,601	406,112	570,687	1.405	65.7
Total	158	26,658	154	11,124,610	7,356,502	13,182,859	1.792	66.1

^a Includes 60 Otto-Hoffmann ovens.^c Includes 50 Semet-Solvay ovens.^b Includes 25 Semet-Solvay ovens in Mercer County.^d Otto-Hoffmann ovens.^e Includes coal used, coke produced, and its value in New York.^f Includes 30 Newton-Chambers and 3 Slocum ovens.

Connellsville district.—In the counties of Fayette and Westmoreland, which contain what is known as the Connellsville coking region, is produced annually more than 50 per cent of the total coke output of the United States. There has been only one exception to this in nineteen years, the one exception being in 1896, when, because of the high prices arbitrarily placed on Connellsville coke by some of the larger producers, consumers were driven to other sources and the production of this region fell off one-third as compared with 1895. Lower prices and the beginning of the industrial revival in 1897 stimulated production somewhat in that year and the output was 1,400,000 tons more than in 1896, but was still 1,320,000 tons short of the production in 1895. The enormous demand by the iron interests for coke in 1898 brought the production up to 8,315,350 tons, or 134,171 tons more than the large production of 1895. The past year was one of extraordinary activity in the region, and while during the summer months some falling off in the demand was occasioned by the annual blowing out of furnaces for repairs, the ability of operators to market their product was, for the greater part of the time, limited only by insufficient car supply.

The following are the statistics of the manufacture of coke in the Connellsville region from 1880 to 1898:

Statistics of the manufacture of coke in the Connellsville region, Pennsylvania, from 1880 to 1898.

Year.	Estab- lish- ments.	Ovens.		Coal used.	Coke pro- duced.	Total value of coke at ovens.	Value of coke at ovens, per ton.	Yield of coal in coke.
		Built.	Build- ing.					
				<i>Short tons.</i>	<i>Short tons.</i>			<i>Per cent.</i>
1880....	67	7,211	731	3,367,856	2,205,946	\$3,948,643	\$1.79	65.5
1881....	70	8,208	654	4,018,782	2,639,002	4,301,573	1.63	65.7
1882....	72	9,283	592	4,628,736	3,043,394	4,473,789	1.47	65.8
1883....	74	10,176	101	5,355,380	3,552,402	4,049,738	1.14	66.3
1884....	76	10,543	200	4,829,054	3,192,105	3,607,078	1.13	66.1
1885....	68	10,471	48	4,683,831	3,096,012	3,776,388	1.22	66.1
1886....	36	11,324	1,895	6,305,460	4,180,521	5,701,086	1.36	66.3
1887....	73	11,923	98	6,182,846	4,146,989	7,437,669	1.79	67
1888....	38	12,818	1,320	7,191,708	4,955,553	5,884,081	1.19	69
1889....	29	14,458	430	8,832,371	5,930,428	7,974,633	1.34	67
1890....	28	15,865	30	9,748,449	6,464,156	11,537,370	1.94	66.3
1891....	33	17,551	0	7,083,705	4,760,665	8,903,454	1.87	67
1892....	31	17,309	0	9,389,549	6,329,452	11,598,407	1.83	67.4
1893....	28	17,504	5	7,095,491	4,806,623	7,141,031	1.49	67.7
1894....	29	17,829	0	7,656,169	5,192,080	5,405,691	1.04	67.8
1895....	29	18,028	80	12,174,597	8,181,179	10,122,458	1.237	67.2
1896....	88	18,347	0	8,107,536	5,462,490	10,018,946	1.834	67.4
1897....	86	18,467	92	10,243,690	6,860,826	10,662,428	1.55	67
1898....	88	18,927	20	12,454,969	8,315,350	12,626,292	1.518	66.8

^a Includes 50 Semet-Solvay by-product ovens.

As will be seen in the above table, the number of ovens increased from 18,467 to 18,927, a gain of 460 over 1897. All of these are of the beehive type, with the exception of 50 Semet-Solvay ovens operated by the Dunbar Furnace Company at Dunbar.

The following table, compiled by the Connellsville Courier, of Connellsville, Pa., shows the shipments of coke from the Connellsville region in 1898, by months, in cars and tons, with the average number of cars shipped each working day in the month:

Shipments of coke from the Connellsville region in 1898, by months.

Month.	Cars.	Daily average.	Tons.
January	38,348	1,475	727,739
February	35,125	1,463	667,287
March	38,994	1,454	744,987
April	36,818	1,416	701,317
May	35,781	1,376	680,754
June	33,589	1,292	636,877
July	34,348	1,321	646,065
August	34,956	1,295	662,880
September	33,851	1,302	644,422
October	38,472	1,480	731,602
November	40,991	1,576	844,907
December	39,976	1,537	771,275
Total	441,249	1,415	8,460,112

The monthly shipments of coke from this region in the years 1896, 1897, and 1898, as reported by the Courier, are given in the following table:

Monthly shipments of coke from the Connellsville region in the years 1896, 1897, and 1898.

[Short tons.]

Month.	1896.	1897.	1898.
January	617,458	485,624	727,739
February	529,347	466,206	667,287
March	550,470	521,484	744,987
April	547,625	493,027	701,317
May	528,822	501,857	680,754
June	477,227	500,483	636,877
July	470,988	583,867	646,065
August	330,468	562,703	662,880
September	257,547	625,902	644,422
October	304,998	737,498	731,602
November	323,419	700,352	844,907
December	473,296	736,049	771,275
Total	5,411,685	6,915,052	8,460,112

The total shipments as given above show comparatively insignificant differences between them and the total production as compiled by the Survey. In 1896 the shipments reported by the Courier were less than the production, and in 1897 and 1898 slightly greater.

The same authority gives the monthly shipments of coke from the Connellsville region in cars during the years 1895, 1896, 1897, and 1898 to the three chief points of general distribution, with the total monthly output and the average daily shipment for each working day in the month, as follows:

Monthly shipments of coke from the Connellsville region, in cars, to points of distribution during 1895, 1896, 1897, and 1898.

[Cars.]

Month.	Pittsburg.	West.	East.	Total.	Daily average.
1895.					
January.....	11,468	19,286	6,716	37,470	1,561
February.....	10,306	15,959	6,224	32,489	1,253
March.....	11,676	22,156	7,962	41,794	1,614
April.....	9,991	14,302	7,189	31,482	1,211
May.....	9,928	13,374	6,612	29,914	1,108
June.....	10,414	17,395	7,359	35,168	1,406
July.....	9,894	17,833	7,530	35,257	1,306
August.....	10,673	20,926	7,557	39,156	1,450
September.....	9,910	19,139	6,863	35,912	1,436
October.....	10,650	21,985	8,163	40,798	1,511
November.....	9,862	23,859	7,723	41,444	1,594
December.....	9,450	22,379	8,530	40,359	1,552
Total.....	124,222	228,593	88,428	441,243	1,410
1896.					
January.....	9,454	15,455	6,946	31,855	1,180
February.....	8,524	13,670	5,240	27,434	1,093
March.....	8,454	15,879	4,345	28,678	1,103
April.....	9,332	15,522	3,823	28,677	1,103
May.....	8,992	15,458	3,551	28,001	1,077
June.....	8,440	12,892	4,295	25,627	985
July.....	8,535	12,406	4,613	25,554	946
August.....	7,014	7,442	3,833	18,289	703
September.....	6,954	4,747	2,864	14,565	560
October.....	8,653	5,714	2,670	17,037	655
November.....	8,771	6,967	2,171	17,909	716
December.....	11,195	11,750	2,566	25,511	945
Total.....	104,318	137,902	46,917	289,137	920

Monthly shipments of coke from the Connellsville region, in cars, to points of distribution during 1895, 1896, 1897, and 1898—Continued.

[Cars.]

Month.	Pittsburg.	West.	East.	Total.	Daily average.
1897.					
January.....	10,583	11,856	3,755	26,194	1,008
February.....	9,727	11,487	4,146	25,360	1,056
March.....	10,881	12,808	4,754	28,443	1,053
April.....	11,787	10,610	4,573	26,970	1,037
May.....	11,574	10,228	5,767	27,569	1,060
June.....	11,900	9,923	5,855	27,678	1,065
July.....	13,841	11,663	5,784	31,288	1,159
August.....	13,210	10,900	5,597	29,707	1,140
September.....	13,370	14,692	5,259	33,321	1,281
October.....	12,682	17,811	5,685	36,178	1,391
November.....	13,248	18,130	5,073	36,451	1,458
December.....	12,640	20,516	5,068	38,224	1,470
Total	145,443	160,624	61,316	367,383	1,181
1898.					
January.....	14,051	19,044	5,253	38,348	1,475
February.....	12,009	17,685	5,431	35,125	1,463
March.....	13,323	19,257	6,414	38,994	1,454
April.....	12,758	18,235	5,825	36,818	1,416
May.....	13,047	17,347	5,387	35,781	1,376
June.....	12,023	16,325	5,241	33,589	1,292
July.....	13,201	15,655	5,492	34,348	1,321
August.....	13,603	15,801	5,552	34,956	1,295
September.....	11,856	16,547	5,448	33,851	1,302
October.....	13,250	19,330	5,892	38,472	1,480
November.....	13,387	20,923	6,681	40,991	1,576
December.....	14,453	18,847	6,676	39,976	1,537
Total	156,961	214,996	69,292	441,249	1,415

The total shipments in cars for the past eleven years were as follows:

Total and daily average shipments in cars from 1888 to 1898.

Year.	Daily average.	Total cars.	Year.	Daily average.	Total cars.
1888.....	905	282,441	1894.....	900	281,677
1889.....	1,046	326,220	1895.....	1,410	441,243
1890.....	1,147	355,070	1896.....	920	289,137
1891.....	884	274,000	1897.....	1,181	367,383
1892.....	1,106	347,012	1898.....	1,415	441,249
1893.....	874	270,930			

The following table shows how prices were quoted throughout the year:

Average monthly prices of Connellsville coke, per short ton, during 1898.

Month.	Furnace.		Foundry.	Crushed.
January.....	\$1.75		\$2.15	*\$2.30
February.....	1.75		2.15	2.30
March.....	1.75		2.15	2.30
April.....	1.75		2.15	2.30
May.....	1.75		2.15	2.30
June.....	\$1.50 to	1.75	2.15	2.30
July.....	1.50	1.75	\$2 to 2.15	2.30
August.....	1.50	1.75	2 2.15	2.30
September.....	1.50	1.75	2 2.15	2.30
October.....	1.50	1.75	2 2.15	2.30
November.....	1.50	1.75	2 2.15	2.30
December.....	1.50	1.75	2 2.15	2.30

How the above compares with the prices for the corresponding months in 1897 may be seen below:

Average monthly prices of Connellsville coke, per short ton, during 1897.

Month.	Furnace.		Foundry.	Crushed.
January.....	\$1.75 to \$2.00		\$2.30	\$2.35
February.....	1.75	2.00	2.30	2.35
March.....	1.50	1.75	2.30	2.35
April.....	1.50	1.60	2.30	2.35
May.....	1.30	1.50	1.75	1.85
June.....		1.50	1.75	1.85
July.....		1.50	2.30	2.30
August.....		1.50	2.30	2.30
September.....	1.40	1.50	2.30	2.30
October.....	1.50	1.75	2.15	2.30
November.....		1.75	2.15	2.30
December.....		1.75	2.15	2.30

The following table gives the ruling and circular prices of blast-furnace coke free on board at the ovens for the past eighteen years:

Monthly prices of Connellsville blast-furnace coke free on board at ovens.

[Per short ton.]

Month.	1881.		1882.		1883.		1884.	1885.	1886.
January	\$1.50 to \$1.75		\$1.70 to \$1.80		\$1.15 to \$1.20		\$1.00	\$1.10	\$1.20
February	1.50	1.75	1.70	1.80	1.10	1.20	1.00	1.10	1.20
March	1.50	1.75	1.70	1.75	1.05		1.00	1.10	1.35
April	1.60	1.75	1.70	1.75	1.05		1.10	1.20	1.35
May	1.60	1.65	1.65	1.70	.95	1.05	1.10	1.20	1.50
June	1.60	1.65	1.50	1.65	.90		1.10	1.20	1.50
July	1.50	1.60	1.35	1.50	.90		1.10	1.20	1.50
August	1.60		1.35		.90		1.10	1.20	1.50
September	1.60		1.25	1.35	1.00		1.10	1.20	1.50
October	1.60	1.65	1.25		1.00		1.10	1.20	1.50
November	1.60	1.65	1.25	1.35	1.00		1.10	1.20	1.50
December	1.60	1.70	1.15	1.35	1.00		1.10	1.20	1.50

Month.	1887.		1888.		1889.		1890.	1891.	1892.
January	\$1.50		\$1.75		\$1.25		\$1.75	\$1.90	\$1.90
February	2.00		1.75		1.25		1.75	1.90	1.90
March	2.00	\$1.25 to 1.50		1.25		2.15	1.90	1.90	
April	2.00	1.00		1.15		2.15	1.90	1.90	
May	2.00	1.00		1.10		2.15	1.90	1.80	
June	2.00	1.00		1.10		2.15	1.90	1.80	
July	2.00	1.00		\$1.00 to 1.10		2.15	1.90	1.75	
August	2.00	1.00		1.10		2.15	1.90	1.75	
September	2.00	1.00		1.25	1.50	2.15	1.85	1.75	
October	2.00	1.00		1.50		2.15	1.85	1.75	
November	2.00	1.25		1.75		2.15	1.80	1.75	
December	2.00	1.25		1.75		2.15	1.80	1.75	

Month.	1893.	1894.		1895.	1896.		1897.		1898.
January	\$1.90	\$0.95 to \$1.00		\$1.00	\$1.75 to \$2.00		\$1.75 to \$2.00		\$1.75
February	1.90	.95		1.00	1.75	2.00	1.75	2.00	1.75
March	1.90	1.00		1.00	1.75	2.00	1.50	1.75	1.75
April	1.70	.92		1.35	1.75	2.00	1.50	1.60	1.75
May	1.60	.92		1.35	1.75	2.00	1.30	1.50	1.75
June	1.50	1.00		1.35	1.75	2.00	1.50		\$1.50 to 1.75
July	1.45	1.00		1.35	1.75	2.00	1.50		1.50 1.75
August	1.25	1.15	2.00	1.35	1.75	2.00	1.50		1.50 1.75
September	1.20	1.30	1.40	1.35	1.75	2.00	1.40	1.50	1.50 1.75
October	1.20	1.00		1.60	1.75	2.00	1.50	1.75	1.50 1.75
November	1.10	1.01		1.60	1.75	2.00	1.75		1.50 1.75
December	1.05	1.00		1.60	1.75	2.00	1.75		1.50 1.75

Upper Connellsville district.—The Upper Connellsville district includes that portion of the Connellsville trough or basin lying north of a point a short distance below Latrobe. The coal differs somewhat from that of the lower part of the basin, so that, in addition to its geographical position, there is another reason for the separation of the production of this field from that of the Connellsville field proper. The Upper Connellsville region reported a total of 1,832 ovens in 1898, of which 409, or nearly one-fourth, were idle. The idle ovens do not include the 3 Slocum ovens erected at Bolivar, and which have never been operated. They are considered as abandoned, together with 28 other ovens in the district, making a decrease of 31 as compared with 1897. The producing ovens include 30 Newton-Chambers ovens at Latrobe, which, however, were not operated as by-product ovens.

The production of this district in 1898, while larger than that of 1897, was not equal to that of 1895, nor to any of the years between 1886 and 1892.

The following are the statistics of the manufacture of coke in the Upper Connellsville region for the years 1880 to 1898:

Statistics of the manufacture of coke in the Upper Connellsville district from 1880 to 1898.

Year.	Estab- lish- ments.	Ovens.		Coal used.	Coke pro- duced.	Total value of coke at ovens.	Value of coke at ovens, per ton.	Yield of coal in coke.
		Built.	Build- ing.					
				<i>Short tons.</i>	<i>Short tons.</i>			<i>Per cent.</i>
1880	8	757	0	319,927	229,433	\$397,945	\$1.73	72
1881	10	986	0	588,924	343,728	548,362	1.60	58
1882	11	1,118	0	650,174	375,918	536,503	1.43	58
1883	11	1,118	0	668,882	389,053	422,174	1.08	58
1884	11	1,118	0	496,894	294,477	311,665	1.06	59
1885	11	1,168	40	555,735	319,297	346,168	1.08	57
1886	12	1,337	29	691,331	442,968	572,073	1.29	64.1
1887	16	1,442	87	717,274	470,233	840,144	1.79	65.6
1888	16	1,977	0	657,966	441,966	617,189	1.40	67
1889	13	1,568	80	635,220	417,263	609,828	1.46	65.6
1890	14	1,569	28	889,277	577,246	1,008,102	1.75	64.9
1891	14	1,724	0	1,000,184	649,316	1,111,056	1.71	65
1892	14	1,843	0	706,171	451,975	691,323	1.53	64
1893	14	1,843	0	499,809	320,793	447,090	1.39	64
1894	14	1,843	0	279,971	176,799	212,595	1.20	63
1895	14	1,849	^a 30	319,285	208,158	251,892	1.21	65
1896	14	^b 1,863	0	617,601	406,112	570,687	1.405	65.7
1897	14	^b 1,863	0	556,941	345,372	444,709	1.29	62
1898	13	^c 1,832	0	638,277	403,045	538,609	1.34	63

^a Newton-Chambers ovens.

^b Includes 28 by-product ovens.

^c Includes 30 Newton-Chambers ovens.

Allegheny Mountain district.—In this district are included all the ovens along the line of the Pennsylvania Railroad east of Blairsville and those in Somerset County. This district, like the other prominent ones in the State, profited by the higher prices of Connellsville coke in 1896, and has continued to increase its production, the output in 1898 being the largest in six years, and with three exceptions the largest in its history. There were 27 ovens abandoned in 1898, and 160 of those remaining were idle. As an offset to this, 100 Otto-Hoffmann by-product ovens were building at Johnstown at the close of the year, and will probably contribute to the production in 1899.

The statistics of the manufacture of coke in the Allegheny Mountain district from 1880 to 1898 are as follows:

Statistics of the manufacture of coke in the Allegheny Mountain district of Pennsylvania from 1880 to 1898.

Year.	Estab- lish- ments.	Ovens.		Coal used.	Coke pro- duced.	Total value of coke at ovens.	Value of coke at ovens per ton.	Yield of coal in coke.
		Built.	Build- ing.					
				<i>Short tons.</i>	<i>Short tons.</i>			<i>Per cent.</i>
1880.....	8	291	0	201,345	127,525	\$289,929	\$2.27	63
1881.....	9	371	0	225,563	144,430	329,198	2.28	64
1882.....	10	481	0	284,544	179,580	377,286	2.10	63
1883.....	10	532	0	200,343	135,342	240,641	1.78	68
1884.....	12	614	0	241,459	156,290	203,213	1.90	65
1885.....	11	523	82	327,668	212,242	286,539	1.90	65
1886.....	10	579	14	351,070	227,369	374,013	1.64	64.8
1887.....	10	694	150	461,922	297,724	671,437	2.25	64.4
1888.....	12	950	145	521,047	335,689	479,845	1.43	64.4
1889.....	16	1,069	20	564,112	354,288	601,964	1.69	63.5
1890.....	16	1,171	0	633,974	402,514	730,048	1.81	63.5
1891.....	16	1,201	0	708,523	448,067	782,175	1.75	63
1892.....	16	1,260	0	724,903	448,522	775,927	1.73	61.9
1893.....	15	1,260	0	275,865	173,131	264,292	1.53	62.8
1894.....	15	1,253	0	92,965	58,823	71,161	1.21	63.3
1895.....	13	1,233	60	271,096	173,965	214,741	1.23	64
1896.....	13	^a 1,188	0	408,827	266,473	349,373	1.31	65
1897.....	13	^a 1,185	0	417,470	278,578	365,191	1.31	66.7
1898.....	13	^a 1,158	^b 100	572,568	378,410	511,202	1.35	66

^a Includes 60 Otto-Hoffmann ovens.

^b Otto-Hoffmann ovens.

Clearfield-Center district.—This district includes the ovens in Clearfield and Center counties, including Snow Shoe, Moshannon, and other well-known coal districts. There are 7 establishments in this district, 5 of which made coke in 1898, leaving 2 idle. One of the establishments, having 50 ovens, all of which were idle in 1897, ran for a few days only in 1898. The two plants that were idle all the year had 230 ovens. Although there were 50 more ovens in blast in 1898 than in 1897, the production decreased about 10 per cent, with, however, only a slight decline in the total value.

The statistics of the manufacture of coke in the Clearfield-Center district for the years 1880 to 1898 are as follows:

Statistics of the manufacture of coke in the Clearfield-Center district, Pennsylvania, from 1880 to 1898.

Year.	Estab- lish- ments.	Ovens.		Coal used.	Coke pro- duced.	Total value of coke at ovens.	Value of coke at ovens per ton.	Yield of coal in coke.
		Built.	Build- ing.					
				Short tons.	Short tons.			Per cent.
1880	1	0	0	200	100	\$200	\$2.00	50
1881	2	50	0	20,025	13,350	22,695	1.70	67
1882	1	50	0	25,000	17,160	27,406	1.60	69
1883	1	60	0	26,500	18,696	28,844	1.50	71
1884	1	60	0	33,000	23,431	32,849	1.40	71
1885	2	245	0	69,720	48,103	70,331	1.46	69
1886	3	299	20	84,870	55,810	94,877	1.70	66
1887	6	523	10	154,566	97,852	198,095	2.02	63.3
1888	6	601	0	172,999	115,338	174,220	1.51	66.6
1889	6	671	0	195,473	120,734	215,112	1.78	61.7
1890	7	701	0	331,104	212,286	391,957	1.85	64
1891	7	666	0	293,542	183,911	339,082	1.84	63
1892	7	731	0	231,357	147,819	264,422	1.79	63.9
1893	8	695	0	155,119	98,650	171,482	1.74	63.6
1894	8	694	0	61,428	38,825	51,482	1.33	63
1895	8	695	0	155,088	99,469	131,188	1.32	64
1896	7	666	0	183,056	118,155	164,266	1.39	64.5
1897	7	668	0	230,395	153,517	197,139	1.28	66
1898	7	668	0	215,208	137,265	195,836	1.43	63.8

Broad Top district.—This district includes the ovens situated in Bedford and Huntingdon counties, comprising what is known as the Broad Top coal field. There were 500 completed ovens in the field in 1898, a gain of 9 over 1897. Of these, 232 were idle in 1898, as compared with 248 idle ovens in 1897. The production of the district increased 20 per cent.

The statistics of the manufacture of coke in the Broad Top region from 1880 to 1898 are shown in the following table:

Statistics of the manufacture of coke in the Broad Top region, Pennsylvania, from 1880 to 1898.

Year.	Estab- lish- ments.	Ovens.		Coal used.	Coke pro- duced.	Total value of coke at ovens.	Value of coke at ovens per ton.	Yield of coal in coke.
		Built.	Build- ing.					
				Short tons.	Short tons.			Per cent.
1880	5	188	105	92,894	51,130	\$123,748	\$2.40	55
1881	5	188	105	111,593	66,560	167,074	2.51	59
1882	5	293	50	170,637	105,111	215,079	2.05	62
1883	5	343	110	220,932	147,154	271,692	1.84	66
1884	5	453	0	227,954	151,959	264,569	1.74	66
1885	5	537	0	190,836	112,073	185,656	1.65	58
1886	5	562	100	171,137	108,294	187,321	1.73	63.3
1887	5	581	0	262,730	164,535	347,061	2.11	62.6
1888	5	591	0	196,015	119,469	286,655	2.40	61
1889	5	589	0	152,090	91,256	186,718	2.05	60
1890	5	482	16	247,823	157,208	314,416	2.00	63
1891	5	448	0	146,008	90,728	197,048	2.17	62
1892	5	448	8	185,600	117,554	216,090	1.84	63.3
1893	5	456	14	136,069	86,752	150,196	1.73	63.8
1894	5	454	14	53,216	34,089	51,815	1.52	64
1895	5	460	0	133,276	85,842	150,224	1.75	64.4
1896	5	480	0	111,145	72,175	126,306	1.75	64.9
1897	5	491	15	106,706	66,949	107,430	1.60	62.7
1898	5	500	4	122,820	80,935	124,882	1.543	65.9

Pittsburg district.—Much of the coal made into coke in the Pittsburg district is slack, usually obtained from the mines along the several pools of the Monongahela River and brought to Pittsburg by barges. Latterly also considerable coal has been brought from the fourth pool of the Monongahela River to Pittsburg for coking. The production in 1897 and 1898 shows a notable increase over preceding years. This has been due to the operations of the Otto-Hoffmann by-product plant, begun in 1896 and completed in 1898 at Otto, near McKeesport. The production in this district for 1898 is also augmented by the inclusion of the product formerly credited to the Beaver district. Only 19 of the 1,100 ovens in this district were idle in 1898.

The statistics of the manufacture of coke in the Pittsburg district, Pennsylvania, for the years 1880 to 1898 are stated in the following table:

Statistics of the manufacture of coke in the Pittsburg district, Pennsylvania, from 1880 to 1898.

Year.	Estab- lish- ments.	Ovens.		Coal used.	Coke pro- duced.	Total value of coke at ovens.	Value of coke at ovens, per ton.	Yield of coal in coke.
		Built.	Build- ing.					
				<i>Short tons.</i>	<i>Short tons.</i>			<i>Per cent.</i>
1880	21	534	0	194,393	105,974	\$254,500	\$2.40	55
1881	21	538	0	178,509	96,310	206,965	2.15	54
1882	21	557	0	114,956	64,779	134,378	2.07	56.3
1883	20	542	0	119,310	66,820	126,020	1.89	56
1884	20	535	0	97,367	53,857	99,911	1.87	55
1885	17	416	4	91,101	46,930	72,509	1.55	51.5
1886	18	730	0	228,874	138,646	221,617	1.88	60.6
1887	20	880	235	366,184	177,097	315,546	1.78	48.4
1888	22	980	0	428,899	264,156	350,818	1.33	62
1889	17	600	21	233,571	141,324	283,402	2.00	60.5
1890	14	541	0	149,230	93,984	171,465	1.82	63
1891	13	590	11	154,054	94,160	201,458	2.14	61
1892	15	725	261	292,357	176,365	376,613	2.14	60.3
1893	10	885	0	357,400	216,268	438,801	2.03	60.5
1894	9	779	104	371,569	227,100	351,825	1.55	61
1895	9	973	0	452,845	232,529	547,284	2.35	51.3
1896	11	1,264	^a 120	583,984	368,070	941,076	2.56	63
1897	9	^b 1,233	200	832,505	548,981	864,326	1.57	66
1898	10	^c 1,100	168	836,948	552,742	899,537	1.627	66

^a Otto-Hoffmann by-product ovens.

^b Includes 120 Otto-Hoffmann ovens.

^c Includes 120 Otto-Hoffmann and 25 Somet-Solvay ovens.

Beaver district.—All the ovens in Beaver County, 8 in number, were abandoned in 1898, and the statistics of production of coke in Mercer County have been included with the Pittsburgh district.

The following are the statistics of the manufacture of coke in the Beaver district, Pennsylvania, for the years 1880 to 1897:

Statistics of the manufacture of coke in the Beaver district, Pennsylvania, from 1880 to 1897.

Year.	Estab- lish- ments.	Ovens.		Coal used.	Coke pro- duced.	Total value of coke at ovens.	Value of coke at ovens, per ton.	Yield of coal in coke.
		Built.	Build- ing.					
				Short tons.	Short tons.			Per cent.
1880	5	106	.....	8,013	4,880	\$10,150	\$2.08	61
1881	5	106	.....	6,887	4,333	9,013	2.08	63
1882	5	106	.....	11,699	7,960	15,124	1.90	68
1883	5	107	.....	19,510	12,395	21,062	1.70	64
1884	4	89	.....	2,250	1,390	2,168	1.56	62
1885	4	89	.....	686	438	696	1.59	63
1886	3	87	.....	698	411	646	1.57	59
1887	3	65	.....	25,207	13,818	24,137	1.75	55
1888	4	145	.....	262	175	260	1.48	66.6
1889	3	90	.....	3,100	1,853	3,848	2.07	60
1890	3	90	.....	4,010	2,148	4,564	2.12	53.5
1891	3	88	.....	4,224	2,332	6,663	2.86	55
1892	2	10	0	3,925	2,154	6,270	2.91	54.9
1893	2	10	0	2,998	1,644	4,446	2.70	54.8
1894	2	8	0	2,968	1,624	4,251	2.62	54.7
1895	2	8	0	2,888	1,584	3,940	2.49	54.8
1896	3	a 35	0	13,845	9,004	17,200	1.91	65
1897	3	a 33	0	42,200	27,276	61,646	2.26	64.6

a Includes 25 Somet-Solvay ovens in Mercer County.

Allegheny Valley district.—The ovens in Armstrong and Butler counties are included in this district. Production is irregular, all of the ovens having been idle four years in the last seven. They were idle in 1898.

The statistics of the manufacture of coke in the Allegheny Valley district for the years 1880 to 1898 are as follows:

Statistics of the manufacture of coke in the Allegheny Valley district, Pennsylvania, from 1880 to 1898.

Year.	Estab-lish-ments.	Ovens.		Coal used.	Coke produced.	Total value of coke at ovens.	Value of coke at ovens, per ton.	Yield of coal in coke.
		Built.	Build-ing.	Short tons.	Short tons.			Per cent.
1880	5	97	0	45,355	23,470	\$49,068	\$2.10	52
1881	5	109	0	55,676	29,650	64,664	2.18	53
1882	6	159	0	76,000	41,897	80,294	1.92	55
1883	6	159	0	64,810	34,868	62,982	1.81	54
1884	7	209	0	55,110	31,430	54,859	1.75	57
1885	5	208	0	28,630	15,326	30,151	1.97	53.5
1886	5	208	0	51,580	28,948	44,422	1.54	56
1887	5	288	88	77,666	44,621	84,913	1.90	57.1
1888	5	376	0	37,792	21,719	36,008	1.66	57.5
1889	4	198	0	13,105	6,569	10,538	1.62	50
1890	3	148	0	33,049	18,733	40,204	2.15	56.7
1891	3	148	0	21,833	11,314	25,909	2.29	52
1892	3	148	0	0	0	0	0	0.
1893	2	116	0	10,927	6,557	11,147	1.70	60
1894	2	116	0	0	0	0	0	0
1895	2	116	0	0	0	0	0	0
1896	2	116	0	12,445	7,467	14,934	2.00	60
1897	2	116	0	8,300	5,000	10,000	2.00	60.2
1898	2	116	0	0	0	0	0	0

Reynoldsville-Walston district.—This district includes all the ovens on the Rochester and Pittsburg Railroad, as well as those on the Low Grade Division of the Allegheny Valley Railway, and the mines of the New York, Lake Erie and Western Railroad. Production in this district has increased regularly for the last four years, and the output in 1898 was not only the largest on record for the district, but it exceeded the Pittsburg district and makes the Reynoldsville-Walston next to the Connellsville in importance. All of the coal used in the district itself is slack, but the production includes the operations of the Semet-Solvay plant at Syracuse, New York, where run-of-mine coal is used. The coal is drawn from the Clearfield and Jefferson County mines.

The number of idle ovens in 1898 was 190, against 290 in 1897. Thirty-eight ovens were abandoned.

The following are the statistics of the manufacture of coke in the Reynoldsville-Walston district for the years 1880 to 1898:

Statistics of the manufacture of coke in the Reynoldsville-Walston district, Pennsylvania, from 1880 to 1898.

Year.	Estab-lish-ments.	Ovens.		Coal used.	Coke pro-duced.	Total value of coke at ovens.	Value of coke at ovens, per ton.	Yield of coal in coke.
		Built.	Build-ing.					
				<i>Short tons.</i>	<i>Short tons.</i>			<i>Per cent.</i>
1880	3	117	0	45,055	28,090	\$46,359	\$1.65	62
1881	4	125	2	99,489	44,260	80,785	1.85	44
1882	5	177	0	87,314	44,709	80,339	1.80	51
1883	6	229	0	76,580	37,044	65,584	1.77	48
1884	7	321	0	159,151	78,646	113,155	1.44	49
1885	8	600	143	183,806	114,409	153,795	1.35	62
1886	9	783	500	271,037	161,828	217,834	1.35	59.7
1887	11	1,492	134	507,320	316,107	592,728	1.88	62.3
1888	9	1,636	100	404,346	253,662	320,203	1.26	62.7
1889	8	1,747	0	514,461	313,011	436,857	1.40	60.8
1890	8	1,737	0	652,966	406,184	771,996	1.90	62
1891	7	1,747	0	769,100	470,479	744,098	1.58	61
1892	8	1,734	0	683,539	425,250	743,227	1.75	62.2
1893	8	1,755	0	562,033	339,314	586,212	1.73	60.4
1894	8	1,755	0	336,554	207,238	297,596	1.44	61.6
1895	8	1,637	0	504,092	296,820	357,266	1.20	58.9
1896 <i>a</i>	7	1,852	34	770,104	445,998	673,625	1.51	57.9
1897 <i>a</i>	6	1,980	0	810,808	491,267	759,609	1.55	60.6
1898 <i>a</i>	5	1,942	0	1,022,196	600,084	846,121	1.41	58.7

a Includes coal used, coke produced, and its value in New York.

Blossburg district.—This district, which was at one time of considerable importance as a coke-producing district, especially to central and western New York, produced very little coke in 1894 and 1895, and none in 1896, 1897, or 1898. The ovens have been abandoned.

Statistics of the manufacture of coke in the Blossburg district, Pennsylvania, from 1880 to 1895.

Year.	Estab-lish-ments.	Ovens.		Coal used.	Coke pro-duced.	Total value of coke at ovens.	Value of coke at ovens, per ton.	Yield of coal in coke.
		Built.	Build-ing.					
				<i>Short tons.</i>	<i>Short tons.</i>			<i>Per cent.</i>
1880	1	200	0	72,520	44,836	\$134,500	\$3.00	62
1881	1	200	0	88,055	56,085	168,250	3.00	64
1882	1	200	0	100,119	64,526	193,500	3.00	64
1883	2	344	0	71,028	44,690	122,450	2.74	63
1884	2	344	32	62,365	39,043	93,763	2.40	63
1885	2	296	0	46,489	26,975	59,423	2.17	58
1886	2	405	0	136,136	81,801	174,532	2.13	60
1887	2	406	0	182,623	103,873	234,622	2.26	56.9
1888	2	407	0	62,063	38,052	81,400	2.14	61
1889	2	407	0	31,806	18,422	47,765	2.59	58
1890	2	407	0	41,785	23,196	62,804	2.71	55.5
1891	2	407	0	46,084	24,351	66,195	2.72	53
1892	2	407	0	30,746	16,675	45,855	2.75	54.2
1893	2	407	0	22,176	11,463	31,427	2.74	51.7
1894	1	250	0	670	332	896	2.70	50
1895	1	200	0	976	488	1,220	2.50	50

Greensburg district.—A small number of ovens in the Greensburg coal basin is reported separately by this district. The number of completed ovens reported in 1898 was 218, an increase of 40 over the preceding year. Ten were idle. The production, while not large when compared with other districts, has increased steadily since 1894.

Statistics of the manufacture of coke in the Greensburg district, Pennsylvania, from 1889 to 1898.

Year.	Estab-lish-ments.	Ovens.		Coal used.	Coke pro-duced.	Total value of coke at ovens.	Value of coke at ovens, per ton.	Yield of coal in coke.
		Built.	Build-ing.					
				<i>Short tons.</i>	<i>Short tons.</i>			<i>Per cent.</i>
1889	2	50	16	32,070	20,459	\$21,523	\$1.05	63.8
1890	2	58	0	44,000	30,261	44,290	1.46	68.7
1891	2	58	0	38,188	22,441	36,627	1.63	59
1892	2	58	0	15,005	9,037	13,173	1.46	60.2
1893	3	88	0	29,983	18,393	26,303	1.43	61
1894	3	118	0	27,290	15,872	18,413	1.16	58.2
1895	3	118	0	31,300	20,309	22,340	1.10	65
1896	3	178	0	36,963	24,642	30,928	1.255	66
1897	3	178	0	81,927	52,495	65,619	1.25	64
1898	3	218	0	112,487	64,295	96,443	1.50	57

Irwin district.—The Irwin district comprises the ovens situated near the town of that name; also those located in what may be termed the Irwin basin, on the Youghiogheny River. It will be noted that this district is of considerable importance as a coke producer. Most of the coke made in the district is produced by the Carnegie Steel Company, Limited, at Larimer and Douglas, where slack from the gas coal mined in the immediate vicinity is made into coke. The coal coked by the Carnegie Company is washed before it is charged into the ovens. One of the other works uses unwashed slack, and one uses unwashed run of mine. One establishment having 117 ovens was idle in 1897. These were operated in 1898, but one bank of 25 ovens was idle.

The statistics of the manufacture of coke in the Irwin district from 1889 to 1898 are shown in the following table:

Statistics of the manufacture of coke in the Irwin district, Pennsylvania, from 1889 to 1898.

Year.	Estab- lish- ments.	Ovens.		Coal used.	Coke pro- duced.	Total value of coke at ovens.	Value of coke at ovens, per ton.	Yield of coal in coke.
		Built.	Build- ing.					
				Short tons.	Short tons.			Per cent.
1889	4	696	0	373,913	243,448	\$351,304	\$1.44	65
1890	4	661	0	270,476	172,329	256,458	1.49	63.7
1891	4	696	0	323,099	197,082	266,061	1.35	61
1892	4	669	0	328,193	202,809	284,029	1.40	61.8
1893	5	725	0	238,832	150,463	175,609	1.30	63
1894	5	725	0	176,318	110,995	119,764	1.08	63
1895	5	725	0	166,124	103,872	105,609	1.017	62.5
1896	5	696	0	279,104	175,916	275,518	1.566	63
1897	5	696	0	207,704	136,663	189,869	1.39	65.8
1898	5	696	0	332,368	183,176	239,583	1.308	55

TENNESSEE.

Tennessee's coke production, while larger in 1898 than in 1897, did not increase in the same proportion as that of Colorado and Virginia, the rivals with Tennessee for fourth place among the coke-producing States. Consequently Tennessee drops behind both the other States to sixth place for the first time in its history. Tennessee led both of the other States up to 1891. Since that time it has been passed by Colorado five times, but fell behind Virginia for the first time in 1898.

The consumption of coal in the manufacture of coke in Tennessee reached its maximum in 1898, but there were two years in which the coke product was larger than that of last year, and a number of years in which the value was greater. There were 198 ovens idle out of a total of 1,949 in 1898, against 170 out of a total of 1,948 in 1897.

The following are the statistics of the manufacture of coke in Tennessee for the years 1880 to 1898.

Statistics of manufacture of coke in Tennessee from 1880 to 1898.

Year.	Estab-lish-ments.	Ovens.		Coal used.	Coke pro-duced.	Total value of coke at ovens.	Value of coke at ovens, per ton.	Yield of coal in coke.
		Built.	Build-ing.					
				Short tons.	Short tons			Per cent.
1880.....	6	656	68	217,656	130,609	\$316,607	\$2.42	60
1881.....	6	724	84	241,644	143,853	342,585	2.38	60
1882.....	8	861	14	313,537	187,695	472,505	2.52	60
1883.....	11	992	10	330,961	203,691	459,126	2.25	62
1884.....	a 13	1,105	175	348,295	219,723	428,870	1.95	63
1885.....	12	1,387	36	412,538	218,842	398,459	1.82	53
1886.....	12	1,485	126	621,669	368,139	687,865	1.87	59
1887.....	11	1,560	165	653,857	396,979	870,900	2.19	61
1888.....	11	1,634	84	630,099	385,693	490,491	1.27	61
1889.....	12	1,639	40	626,016	359,710	731,496	2.03	57
1890.....	11	1,664	292	600,387	348,728	684,116	1.96	58
1891.....	11	1,995	0	623,177	364,318	701,803	1.93	58
1892.....	11	1,941	0	600,126	354,096	724,106	2.05	59
1893.....	11	1,942	0	449,511	265,777	491,523	1.83	61
1894.....	11	1,860	0	516,802	292,646	480,124	1.64	56.6
1895.....	12	1,903	0	684,655	396,790	754,926	1.90	57.9
1896.....	15	1,861	100	600,379	339,202	624,011	1.84	56.5
1897.....	15	1,948	0	667,996	368,769	667,656	1.81	55
1898.....	15	1,949	40	722,356	394,545	642,920	1.63	54.6

a One establishment made coke in pits.

The character of the coal used in the manufacture of coke in Tennessee since 1890 is shown in the following table:

Character of coal used in the manufacture of coke in Tennessee since 1890.

Year.	Run of mine.		Slack.		Total.
	Unwashed.	Washed.	Unwashed.	Washed.	
	Short tons.	Short tons.	Short tons.	Short tons.	Short tons.
1890.....	255,355	0	273,028	72,000	600,387
1891.....	184,156	0	377,914	60,707	623,177
1892.....	176,453	15,000	367,827	40,846	600,126
1893.....	179,126	0	137,483	132,902	449,511
1894.....	166,990	61,841	149,958	138,013	516,802
1895.....	96,744	59,284	285,906	242,721	684,655
1896.....	0	206,319	219,231	174,829	600,379
1897.....	36,485	400,166	119,755	111,590	667,996
1898.....	37,217	306,969	122,756	255,414	722,356

TEXAS.

The twenty ovens mentioned in the report for 1897 as having been erected by the Texas and Pacific Coal Company for converting its slack coal into coke have not proved the success that was hoped for, and they have been abandoned.

UTAH.

As there is but one establishment making coke in Utah, detailed statistics of production have been included with that of Colorado, as the coals in this State are practically identical in character with those of western Colorado.

The following is the amount of coke produced in Utah from 1889 to 1898:

Production of coke in Utah from 1889 to 1898.

Year.	Tons.	Year.	Tons.
1889.....	761	1894.....	16,056
1890.....	8,528	1895.....	22,519
1891.....	7,949	1896.....	20,447
1892.....	7,309	1897.....	23,617
1893.....	16,005	1898.....	28,826

VIRGINIA.

Coke making in Virginia has developed rapidly in the last five years, the output in each year from 1894 to 1898 being the largest up to that time. The tonnage in 1898 showed an increase of 50 per cent over 1897, nearly 100 per cent over 1896, 117 per cent over 1895, and was nearly three times that of 1894. Nearly all of this increase has been due to the development of the coke-making industry in Wise County, on the Clinch River Division of the Norfolk and Western Railroad. Prior to 1895 there were only two establishments in the State, one of which was at Pocahontas, in the Flat Top coal region, the other at Low Moor, just east of the West Virginia line. The coal for the Pocahontas ovens is drawn from mines which extend beyond the boundary line between Virginia and West Virginia, and much if not the greater part of the product belongs of right to the latter State. It has been customary, however, to credit all of the product to Virginia, as the openings are in that State. The ovens at Low Moor are fed entirely by coal mined in the New River district of West Virginia. The Clinch Valley or Wise County product belongs entirely to Virginia, and the manufacture of coke from coal mined in the State really began with the building of the ovens in Wise County in 1895. Over 60 per cent of the coke product in 1897 and 1898 was from this region. An addition of con-

siderable importance was made to the coke-making equipment of this, known as the Toms Creek, region by the construction during 1897-98, of an extensive coal handling and washing plant by the Virginia Iron, Coal, and Coke Company, formerly the Toms Creek Coal and Coke Company, and, as shown in a subsequent table, there was an increase of 150,000 tons, or 250 per cent, in the amount of washed slack coal used in the manufacture of coke. An important addition was also made in the Pocahontas region in Virginia by the construction in 1898 of a bank of 60 Newton-Chambers by-product ovens. These have been added to the already extensive plant of the Southwest Virginia Improvement Company in Tazewell County. The number of new ovens completed in the State in 1898 was 111, bringing the total up to 1,564, of which number only 4 were idle in 1898, and most of the active ones were run steadily during the year. A little over half of the coal charged into the ovens was slack, and nearly half of the slack coal in 1898 was washed. Up to 1895 all of the coal used was unwashed. In 1896, 13,584 tons, or 3 per cent, was washed slack. In 1897 this was increased to 61,021 tons, or more than 10 per cent of the total, while in 1898 the washed slack was 210,099 tons, or 25 per cent of the total. All of the run-of-mine coal used is unwashed.

The following are the statistics of the manufacture of coke in Virginia from 1883 to 1898:

Statistics of the manufacture of coke in Virginia from 1883 to 1898.

Year.	Estab- lish- ments.	Ovens.		Coal used.	Coke pro- duced.	Total value of coke at ovens.	Value of coke at ovens per ton.	Yield of coal in coke.
		Built.	Build- ing.					
				Short tons.	Short tons.			Per cent.
1883	1	200	0	39,000	25,340	\$44,345	\$1.75	65
1884	1	200	0	99,000	63,600	111,300	1.75	64.3
1885	1	200	0	81,899	49,139	85,993	1.75	60
1886	2	350	100	200,018	122,352	305,880	2.50	61.2
1887	2	350	300	235,841	166,947	417,368	2.50	70.8
1888	2	550	0	230,529	140,199	260,000	1.74	64.7
1889	2	550	250	238,793	146,528	325,861	2.22	61
1890	2	550	250	251,683	165,847	278,724	1.68	66
1891	2	550	250	285,113	167,516	265,107	1.58	58.8
1892	2	594	206	226,517	147,912	322,486	2.18	65.3
1893	2	594	206	194,059	125,092	282,898	2.26	64.5
1894	2	736	100	280,524	180,091	295,747	1.64	64.2
1895	5	832	350	410,737	244,738	322,564	1.32	59.6
1896	7	1,138	101	454,964	268,081	404,573	1.509	58.9
1897	6	1,453	110	574,542	354,067	495,864	1.40	61.6
1898	6	1,564	0	852,972	531,161	699,781	1.317	62

^a Includes 60 Newton-Chambers by-product ovens.

The character of the coal used in the manufacture of coke in Virginia since 1890 is shown in the following table:

Character of coal used in the manufacture of coke in Virginia since 1890.

Year.	Run of mine.		Slack.		Total.
	Unwashed.	Washed.	Unwashed.	Washed.	
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
1890.....	98,215	0	153,468	0	251,683
1891.....	107,498	0	177,615	0	285,113
1892.....	106,010	0	120,507	0	226,517
1893.....	107,498	0	86,561	0	194,059
1894.....	103,874	0	176,650	0	280,524
1895.....	114,802	0	295,935	0	410,737
1896.....	70,756	0	370,624	13,584	454,964
1897.....	286,158	0	227,363	61,021	574,542
1898.....	405,399	0	237,474	210,099	852,972

WASHINGTON.

One company, having a plant of 30 ovens, went out of business in 1898, reducing the number of establishments from 3 to 2 and the number of ovens from 120 to 90. The remaining ovens were, however, unusually active during 1898, and the total product of the State was increased 4,008 tons, or 15 per cent, over 1897, which was the largest up to that time. The operations in Washington are not important when considered with the production in some of the Eastern States, but they are the only ovens on the Pacific coast, and are interesting as establishing the adaptability of Washington coals for coke making.

The industry was started in 1884, since which time the production has been as follows:

Statistics of the production of coke in Washington from 1884 to 1898.

Year.	Estab- lish- ments.	Ovens.		Coal used.	Coke pro- duced.	Total value of coke at ovens.	Value of coke at ovens, per ton.	Yield of coal in coke.
		Built.	Build- ing.					
				<i>Short tons.</i>	<i>Short tons.</i>			<i>Per cent.</i>
1884.....	1	0	0	700	400	\$1,900	\$4.75	57.5
1885.....	1	2	0	544	311	1,477	4.75	57
1886.....	1	11	21	1,400	825	4,125	5.00	58.9
1887.....	1	30	0	22,500	14,625	102,375	7.00	65
1888.....	1	30	100	0	0	0	0	0
1889.....	1	30	0	6,983	3,841	30,728	8.00	55
1890.....	2	30	80	9,120	5,837	46,696	8.00	64
1891.....	2	80	0	10,000	6,000	42,000	7.00	60
1892.....	3	84	30	12,372	7,177	50,446	7.03	58
1893.....	3	84	0	11,374	6,731	34,207	5.08	59
1894.....	3	84	0	8,563	5,245	18,249	3.48	61.2
1895.....	3	110	0	22,973	15,129	64,632	4.27	65.9
1896.....	3	120	0	38,685	25,949	104,894	4.04	67
1897.....	3	120	0	39,124	26,189	115,754	4.42	67
1898.....	2	90	0	48,559	30,197	128,933	4.27	62.2

The character of the coal used in the manufacture of coke in Washington since 1890 is shown in the following table:

Character of coal used in the manufacture of coke in Washington since 1890.

Year.	Run of mine.		Slack.		Total.
	Unwashed.	Washed.	Unwashed.	Washed.	
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
1890.....	0	9,120	0	0	9,120
1891.....	0	0	10,000	0	10,000
1892.....	0	0	0	12,372	12,372
1893.....	0	10,974	0	405	11,379
1894.....	0	0	0	8,563	8,563
1895.....	0	0	0	22,973	22,973
1896.....	0	20,967	0	17,718	38,685
1897.....	0	39,124	0	0	39,124
1898.....	0	48,559	0	0	48,559

WEST VIRGINIA.

West Virginia ranks next to Pennsylvania as a coke-producing State, the lead taken over Alabama in 1896 having been maintained, and, by the increased production in 1898, firmly established. The production in West Virginia in 1898 approximated 2,000,000 short tons, and was about 275,000 short tons in excess of that of 1896, which was the banner year prior to 1898. The large production in 1896 was due to the business thrown into West Virginia by the factitious prices placed on Connellsville coke by some of the larger producers in that region. With lower prices for Connellsville coke in 1897 production in that region increased and reacted upon the industry in West Virginia, where the production fell off about 175,000 tons. The impetus given to the iron trade by the industrial revival in 1898 was reflected in this State by an increase in coke production of over 450,000 tons, or 31 per cent.

The coking regions of West Virginia have been separated by the late Joseph D. Weeks into five distinct districts, and the nomenclature adopted by Mr. Weeks has become generally recognized, viz, the Kanawha, the New River, the Flat Top, the Upper Monongahela, and the Upper Potomac. The first two are compact and continuous. They include the ovens along the line of the Chesapeake and Ohio Railroad from west of Lowmoor, in Virginia, to the Kanawha Valley. The Flat Top region includes the ovens in what is sometimes called the Pocahontas district. The fourth district, the Upper Monongahela or Northern, is a scattered one, including the ovens in Preston, Taylor, Harrison, and Marion counties, on the upper waters of the Monongahela River. The district which has been termed the Upper Potomac

includes the coke ovens in the Elk Garden and Upper Potomac fields. These districts have been so frequently described that it is not necessary to repeat the description at this point, but those interested are referred to previous volumes of Mineral Resources.

All of the five districts increased their production in 1898. The Flat Top being the largest producer had also the greatest increase in amount and percentage. The New River district, second in importance, was second also in amount of increase and third in percentage of increase. The Upper Potomac, third in production and in amount of increase, was second in the percentage of increase. The Upper Monongahela district, fourth in rank, had the smallest increase in production for 1898.

The following table exhibits the statistics of coke production in West Virginia since 1880:

Statistics of the manufacture of coke in West Virginia from 1880 to 1898.

Year.	Estab- lish- ments.	Ovens.		Coal used.	Coke pro- duced.	Total value of coke at ovens.	Value of coke at ovens, per ton.	Yield of coal in coke.
		Built.	Build- ing.					
				Short tons.	Short tons.			Per cent.
1880.....	18	631	40	230,758	138,755	\$318,797	\$2.30	60
1881.....	19	689	0	304,823	187,126	429,571	2.30	61
1882.....	22	878	0	366,653	230,398	520,437	2.26	63
1883.....	24	962	9	411,159	257,519	563,490	2.19	63
1884.....	27	1,005	127	385,588	223,472	425,952	1.91	62
1885.....	27	978	63	415,533	260,571	485,588	1.86	63
1886.....	29	1,100	317	425,002	264,158	513,843	1.94	62
1887.....	39	2,080	742	698,327	442,031	976,732	2.21	63.3
1888.....	51	2,764	318	854,531	525,927	896,797	1.71	61.5
1889.....	53	3,438	631	1,001,372	607,880	1,074,177	1.76	60
1890.....	55	4,060	334	1,395,266	833,377	1,524,746	1.83	60
1891.....	55	4,621	555	1,716,976	1,009,051	1,845,043	1.83	58.8
1892.....	72	5,843	978	1,709,183	1,034,750	1,821,965	1.76	60.5
1893.....	75	7,354	132	1,745,757	1,062,076	1,716,907	1.62	60.8
1894.....	78	7,858	60	1,976,128	1,193,933	1,639,687	1.373	60.4
1895.....	78	7,834	55	2,087,816	1,285,206	1,724,239	1.34	61.6
1896.....	84	8,351	28	2,687,104	1,649,755	2,259,999	1.37	61.4
1897.....	84	8,404	38	2,413,283	1,472,666	1,933,808	1.31	61
1898.....	87	8,659	161	3,145,398	1,925,071	2,432,657	1.26	61.2

^a Includes 60 Somet-Solvay ovens.

It will be seen from the foregoing table that there have been only 2 exceptions in 19 years to a steadily increased production. The first instance, in 1884, was unimportant; the second, in 1897, has already been explained.

It appears from this table that the total number of completed ovens in West Virginia in 1898 was 8,659, an increase of 255 over 1897. Of this total in 1898 568 ovens were idle—38 in the Kanawha district, 130 in the New River district, and all the rest, 400 out of a total of 1,449, in the Upper Monongahela district. All of the 4,667 ovens in the Flat Top district and of the 622 ovens in the Upper Potomac district were operated in 1898. As a partial offset to the large number of idle ovens and the small increase in production in the Upper Monongahela district during 1898 is to be noted the construction of a plant of 60 Semet-Solvay by-product ovens at Wheeling, which, while outside of the proper limitations of that district, are included in it for want of a better classification. These ovens were not completed until December, and were fired up the first of that month. The output, consequently, from this plant had little effect upon the total for the year, but will show its results in the statistics for 1899.

The following table shows that the greater portion of the coal used in the manufacture of coke in West Virginia is slack, from 80 to 90 per cent of the total being of this character. Two thirds of the total is unwashed slack coal, and nearly all of run-of-mine coal used is unwashed.

The character of the coal used in the manufacture of coke in West Virginia since 1890 is shown in the following table:

Character of coal used in the manufacture of coke in West Virginia since 1890.

Year.	Run of mine.		Slack.		Total.
	Unwashed.	Washed.	Unwashed.	Washed.	
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
1890.....	324,847	0	930,989	139,430	1,395,266
1891.....	276,259	0	1,116,060	324,657	1,716,976
1892.....	298,824	115,397	1,108,353	186,609	1,709,183
1893.....	324,932	15,240	1,176,656	228,929	1,745,757
1894.....	162,270	14,901	1,607,735	191,222	1,976,128
1895.....	408,725	24,054	1,476,003	182,034	2,087,816
1896.....	407,378	33,096	2,079,237	167,393	2,687,104
1897.....	373,205	28,145	1,800,528	211,405	2,413,283
1898.....	713,815	0	2,137,983	293,600	3,145,398

PRODUCTION, BY DISTRICTS.

Three of the coke-producing districts of West Virginia are in the southern part of the State and two are in the northern portion. All three of the southern districts—the Flat Top, the New River, and the Kanawha—are drained by the New River, or its western end, the Kanawha. The northern districts, as their names imply, are drained respectively by the headwaters of the Potomac and Monongahela rivers. The Upper Potomac is the only district on the eastern slope

of the Allegheny Mountains. The Flat Top district is by far the most important, 55 per cent of the total output in 1898 being from this district. New River district comes second, with 17 per cent of the total, and the Upper Potomac third, with 12 per cent.

In the following tables will be found consolidated the statistics of the production of coke in West Virginia in the three years especially covered by this report, viz, 1896, 1897, and 1898, by districts:

Production of coke in West Virginia in 1898, by districts.

District.	Estab- lish- ments.	Ovens.		Coal used.	Coke pro- duced.	Total value of coke produced.	Aver- age price of coke per ton.	Yield of coal in coke.
		Built.	Build- ing.					
				<i>Short tons.</i>	<i>Short tons.</i>			<i>Per cent.</i>
Flat Top	36	4,667	27	1,701,404	1,057,626	\$1,216,069	\$1.15	62.2
Kanawha	8	622	100	225,240	135,867	208,949	1.538	60
New River ...	18	1,299	4	519,937	317,998	484,001	1.52	61
Upper Monon- gahela	23	4,449	30	319,590	183,430	194,277	1.06	57
Upper Poto- mac	2	622	0	379,227	230,150	329,371	1.43	60.7
Total ...	87	8,659	161	3,145,398	1,925,071	2,432,657	1.26	61.2

^a Includes 60 Semet-Solvay ovens.

Production of coke in West Virginia in 1897, by districts.

District.	Estab- lish- ments.	Ovens.		Coal used.	Coke pro- duced.	Total value of coke produced.	Aver- age price of coke per ton.	Yield of coal in coke.
		Built.	Build- ing.					
				<i>Short tons.</i>	<i>Short tons.</i>			<i>Per cent.</i>
Kanawha	7	576	20	199,312	117,849	\$187,359	\$1.59	59.1
New River ...	17	1,225	0	439,103	268,263	419,151	1.56	61.1
Flat Top	36	4,648	18	1,172,206	720,988	868,484	1.20	61.5
Upper Monon- gahela	22	1,363	0	289,678	175,165	180,802	1.03	60.5
Upper Poto- mac	2	592	0	312,984	190,401	278,012	1.46	60.8
Total ..	84	8,404	38	2,413,283	1,472,666	1,933,808	1.31	61

Production of coke in West Virginia in 1896, by districts.

District.	Estab- lish- ments.	Ovens.		Coal used.	Coke pro- duced.	Total value of coke produced.	Aver- age price of coke per ton.	Yield of coal in coke.
		Built.	Build- ing.					
				<i>Short tons.</i>	<i>Short tons.</i>			<i>Per cent.</i>
Kanawha	7	576	10	259,715	157,741	\$263,210	\$1.67	60.7
New River ...	17	1,259	0	425,219	269,372	443,072	1.64	63.3
Flat Top	36	4,648	18	1,400,369	852,120	1,100,312	1.291	60.8
Upper Monon- gahela	22	1,386	0	331,526	206,429	211,272	1.023	62.3
Upper Poto- mac	2	482	0	270,275	164,093	242,133	1.476	60.7
Total ..	84	8,351	28	2,687,104	1,649,755	2,259,999	1.37	61.4

Pocahontas Flat Top district.—Next to the Connellsville district this is the most important coking region in the United States. Outside of Pennsylvania and Alabama, it produces more coke than any other single State and nearly as much as any two. Like the Connellsville region, it produces a typical blast furnace coke, and as a steam coal the coal used has only one rival—the Clearfield coal of Pennsylvania. Flat Top coke is chemically superior to Connellsville, as it is lower in ash, and is regarded by some ironmasters as the equal in physical properties to Connellsville coke. The production of coke in the district in 1898 was the largest in its history, which dates from 1886. All of the 36 plants in the region, having a total of 4,667 ovens, were operated in 1898.

Statistics of the manufacture of coke in the Flat Top district of West Virginia from 1886 to 1898.

Year.	Estab- lish- ments.	Ovens.		Coal used.	Coke pro- duced.	Total value of coke at ovens.	Value of coke at ovens, per ton.	Yield of coal in coke.
		Built.	Build- ing.					
				<i>Short tons.</i>	<i>Short tons.</i>			<i>Per cent.</i>
1886	2	10	38	1,075	658	\$1,316	\$2.00	61.2
1887	5	348	642	76,274	51,071	100,738	1.97	67
1888	13	882	200	164,818	103,947	183,938	1.77	63
1889	16	1,433	431	387,533	240,386	405,635	1.69	64
1890	17	1,584	252	566,118	325,576	571,239	1.75	57.5
1891	19	1,889	358	537,847	312,421	545,367	1.70	58
1892	30	2,848	933	595,734	353,696	596,911	1.69	59.3
1893	34	4,349	80	746,051	451,503	713,261	1.58	60.5
1894	36	4,648	18	1,229,136	746,762	989,876	1.325	60.7
1895	36	4,648	18	858,913	524,252	656,494	1.25	61
1896	36	4,648	18	1,400,369	852,120	1,100,312	1.291	60.8
1897	36	4,648	18	1,172,206	720,988	868,484	1.20	61.5
1898	36	4,667	27	1,701,404	1,057,626	1,216,059	1.15	62.2

New River district.—This district is second in importance to the Flat Top and adjoins it on the west. It includes the ovens along the Chesapeake and Ohio Railroad from Quinnimont to Nuttallburg. The coal makes an excellent coke, which is in good demand, its market being chiefly east of the mountains. The coke made at Lowmoor, Virginia, really belongs to this district, as the coal is drawn from it.

Of the 1,299 ovens in this district all but 130 (10 per cent) were operated in 1898, and the production was the largest ever reported.

The statistics of the manufacture of coke in the New River district from 1880 to 1898 are as follows:

Statistics of the manufacture of coke in the New River district, West Virginia, from 1880 to 1898.

Year.	Estab- lish- ments.	Ovens.		Coal used.	Coke pro- duced.	Total value of coke at ovens.	Value of coke at ovens, per ton.	Yield of coal in coke.
		Built.	Build- ing.					
				Short tons.	Short tons.			Per cent.
1880	6	468	40	159,032	98,427	\$239,977	\$2.14	62
1881	6	499	0	219,446	136,423	334,652	2.45	62
1882	6	518	0	233,361	148,373	352,415	2.38	64
1883	6	546	0	264,171	167,795	384,552	2.29	64
1884	8	547	12	219,839	135,335	274,988	2.03	62
1885	8	519	0	244,769	156,007	325,001	2.08	63.8
1886	8	513	5	203,621	127,006	281,778	2.22	62
1887	11	518	50	253,373	159,836	401,164	2.51	63
1888	12	743	0	334,695	199,831	390,182	1.95	60
1889	12	773	0	268,185	157,186	351,132	2.23	58.6
1890	12	773	4	275,458	174,295	377,847	2.17	63
1891	13	787	102	309,073	193,711	426,630	2.20	63
1892	14	965	0	315,511	196,359	429,376	2.19	62
1893	13	947	10	281,600	178,049	355,965	2.00	63
1894	14	1,089	0	222,900	140,842	245,154	1.74	63.2
1895	14	978	0	385,899	244,815	404,978	1.65	63.4
1896	17	1,259	0	425,219	269,372	443,072	1.64	63.3
1897	17	1,225	0	439,103	268,263	419,151	1.56	61.1
1898	18	1,299	4	519,937	317,998	484,001	1.52	61

Kanawha district.—The Kanawha district includes all the ovens along the Kanawha River from its formation by the junction of the New and Gauley rivers at Gauley to the western limit of the coal fields. There are 7 establishments in the district, with a total of 622 ovens, all but 38 of which were operated during the year. The largest production recorded in the Kanawha district was in 1895, when the strike in the Flat Top district created a demand for other West Virginia cokes, and the output of this region increased nearly 60 per cent over 1895, and reached a total of 164,729 tons. The production decreased in 1896 and 1897 and increased slightly in 1898.

The statistics of the manufacture of coke in the Kanawha district from 1880 to 1898 are as follows:

Statistics of the manufacture of coke in the Kanawha district, West Virginia, from 1880 to 1898.

Year.	Estab- lish- ments.	Ovens.		Coal used.	Coke pro- duced.	Total value of coke at ovens.	Value of coke at ovens, per ton.	Yield of coal in coke.
		Built.	Build- ing.					
				Short tons.	Short tons.			Per cent.
1880	4	18	0	6,789	4,300	\$9,890	\$2.30	63.3
1881	4	18	0	11,516	6,900	16,905	2.45	60
1882	5	<i>a</i> 138	0	40,782	26,170	62,808	2.40	64
1883	5	<i>a</i> 147	0	58,735	37,970	88,090	2.32	64.6
1884	6	<i>a</i> 177	15	60,281	39,000	76,070	1.95	64.6
1885	7	<i>b</i> 181	63	65,348	37,551	63,082	1.68	57
1886	7	302	170	89,410	54,329	117,649	2.17	60.7
1887	7	548	0	153,784	96,721	201,418	2.08	63
1888	9	572	8	141,641	84,052	146,837	1.75	59
1889	6	474	0	109,466	63,678	117,340	1.84	58
1890	6	474	0	182,340	104,076	196,583	1.89	57
1891	6	474	0	241,427	134,715	276,420	2.05	56
1892	6	506	0	242,627	140,611	284,174	2.02	58
1893	6	506	0	215,108	122,241	237,308	1.94	56.8
1894	6	506	0	176,746	104,160	181,586	1.74	58.9
1895	6	506	0	267,520	164,729	270,879	1.64	61.6
1896	7	576	10	259,715	157,741	263,210	1.67	60.7
1897	7	576	20	199,312	117,849	187,359	1.59	59.1
1898	8	622	100	225,240	135,867	208,949	1.538	60

a Eighty of these ovens are Coppée, the balance beehive.

b Sixty of these ovens are Coppée, the balance beehive.

Upper Potomac district.—In the Upper Potomac district are included the ovens along the line of the West Virginia Central and Pittsburg Railway, running south from near Cumberland, Maryland. This district has been thoroughly described, not only in previous volumes of Mineral Resources, but also in a separate publication by the Survey.

With one exception the coke production of this district has increased each year since it began in 1887. The product in 1898 was more than double that of 1895, a year of exceptional activity in coke production. All of the ovens in this district made coke in 1898.

Statistics of the production of coke in the Upper Potomac district of West Virginia are as follows:

Statistics of the manufacture of coke in the Upper Potomac district of West Virginia from 1887 to 1898.

Year.	Estab- lish- ments.	Ovens.		Coal used.	Coke pro- duced.	Total value of coke at ovens.	Value of coke at ovens, per ton.	Yield of coal in coke.
		Built.	Build- ing.					
				<i>Short tons.</i>	<i>Short tons.</i>			<i>Per cent.</i>
1887	1	20	50	3,565	2,211	\$4,422	\$2.00	62
1888	1	28	0	9,176	5,835	8,752	1.50	64
1889	2	84	0	26,105	17,945	28,559	1.58	69
1890	2	178	28	94,983	61,971	118,503	1.91	65
1891	2	390	39	111,014	76,599	133,549	1.75	69
1892	3	395	0	114,045	78,601	121,208	1.54	69
1893	3	394	0	123,492	84,607	115,250	1.36	68.5
1894	2	394	0	66,598	43,546	43,546	1.00	65.4
1895	2	442	0	183,187	110,753	126,595	1.14	60.5
1896	2	482	0	270,275	164,093	242,133	1.476	60.7
1897	2	592	0	312,984	190,401	278,012	1.46	60.8
1898	2	622	0	379,227	230,150	329,371	1.43	60.7

Upper Monongahela district.—The Upper Monongahela district includes the ovens in the group of counties lying along the line of the Baltimore and Ohio Railroad, near the headwaters of the Monongahela River—Preston, Taylor, Harrison, and Marion counties. There were 23 establishments in this district in 1898, against 22 in 1897, the new establishment being the bank of 60 Semet-Solvay ovens constructed at Wheeling, and although not properly within this district, are included with it for want of a better classification. These ovens were not fired up until December, 1898, and did not add materially to the production for the year. Of the other 22 establishments, one-half were idle, the number of idle ovens being just 400.

Statistics of the manufacture of coke in the Upper Monongahela district, West Virginia, from 1880 to 1898.

Year.	Estab- lish- ments.	Ovens.		Coal used.	Coke pro- duced.	Total value of coke at ovens.	Value of coke at ovens, per ton.	Yield of coal in coke.
		Built.	Build- ing.					
				Short tons.	Short tons.			Per cent.
1880	8	145	0	64,937	36,028	\$68,930	\$1.91	55
1881	9	172	0	73,863	43,803	78,014	1.78	59
1882	11	222	0	92,510	55,855	105,214	1.88	60
1883	13	269	0	88,253	51,754	90,848	1.76	59
1884	13	281	100	78,468	49,139	74,894	1.52	63
1885	12	278	0	105,416	67,013	97,505	1.45	63.5
1886	12	275	104	131,896	82,165	113,100	1.33	62.3
1887	15	646	0	211,330	132,192	268,990	2.03	62.5
1888	17	567	110	213,377	138,097	175,840	1.27	64.7
1889	17	674	200	210,083	128,685	171,511	1.33	62.5
1890	18	1,051	30	276,367	167,459	260,574	1.56	60
1891	15	1,081	56	517,615	291,605	462,677	1.58	56
1892	19	1,129	45	441,266	265,363	390,296	1.47	60.1
1893	19	1,158	42	379,506	225,676	295,123	1.31	59
1894	20	1,221	42	280,748	158,623	179,525	1.13	56.5
1895	20	1,260	37	392,297	240,657	265,293	1.10	61.3
1896	22	1,386	0	331,526	206,429	211,272	1.023	62.3
1897	22	1,363	0	289,678	175,165	180,802	1.03	60.5
1898	23	a 1,449	30	319,590	183,430	194,277	1.06	57

a Includes 60 Semet-Solvay ovens at Wheeling.

WISCONSIN.

All the coke made in Wisconsin is from Connellsville (Pennsylvania) coal, and the coke is standard Connellsville. Its production, therefore, is not of much interest, except as showing that coal can be carried to a distance and successfully made into coke.

The statistics of the manufacture of coke in Wisconsin from 1888 to 1898, inclusive, are as follows:

Statistics of the manufacture of coke in Wisconsin.

Year.	Estab- lish- ments.	Ovens.		Coal used.	Coke pro- duced.	Total value of coke at ovens.	Value of coke at ovens. per ton.	Yield of coal in coke.
		Built.	Build- ing.					
				<i>Short tons.</i>	<i>Short tons.</i>			<i>Per cent.</i>
1888	1	50		1,000	500	\$1,500	\$3.00	50
1889	1	50		25,616	16,016	92,092	5.75	62.5
1890	1	70		38,425	24,976	143,612	5.75	65
1891	1	120	0	52,904	34,387	192,804	5.61	65
1892	1	120	0	54,300	33,800	185,900	5.50	62.2
1893	1	120	0	24,085	14,958	95,851	6.41	62
1894	1	120	0	6,343	4,250	19,465	4.58	67
1895	1	120	0	8,287	4,972	26,103	5.25	60
1896	1	120	0	8,648	5,332	21,000	3.94	62
1897	1	120	0	29,207	17,216	75,000	4.36	59
1898	1	120	0	59,900	35,280	123,480	3.50	59

The character of the coal used in the manufacture of coke in Wisconsin since 1890 is shown in the following table:

Character of coal used in the manufacture of coke in Wisconsin since 1890.

Year.	Run of mine.		Slack.		Total.
	Unwashed.	Washed.	Unwashed.	Washed.	
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
1890	38,425	0	0	0	38,425
1891	52,904	0	0	0	52,904
1892	54,300	0	0	0	54,300
1893	20,474	0	3,611	0	24,085
1894	6,343	0	0	0	6,343
1895	8,287	0	0	0	8,287
1896	0	0	5,183	3,465	8,648
1897	0	0	0	29,207	29,207
1898	0	0	0	59,900	59,900

WYOMING.

There is but one establishment making coke in Wyoming, that of the Cambria Mining Company, located at Cambria, Weston County. This establishment began the manufacture of coke in 1891, but produced no coke in 1892. Manufacture was resumed in 1893 and increased each year until 1898, when it decreased about 25 per cent.

All of the coal used in coking is unwashed slack, which does not give as good a result as washed slack. When the latter is used, the coke is of fine texture and very strong. It is dense, and capable of sustaining any weight ordinarily required of coke used, as this is, in silver smelting. As at present produced, however, the coke is very high in ash.

The statistics of the production of coke in Wyoming from 1891 to 1898, inclusive, are as follows:

Statistics of the production of coke in Wyoming from 1891 to 1898.

Year.	Estab- lish- ments.	Ovens.		Coal used.	Coke pro- duced.	Total value of coke at ovens.	Value of coke at ovens, per ton.	Yield of coal in coke.
		Built.	Build- ing.					
				Short tons.	Short tons.			Per cent.
1891	1	24	0	4,470	2,682	\$8,046	\$3.00	60
1892	1	24	0	0	0	0	0	0
1893	1	24	0	5,400	2,916	10,206	3.50	54
1894	1	24	0	8,685	4,352	15,232	3.50	50
1895	1	74	0	10,240	4,895	17,133	3.50	47.8
1896	1	74	0	41,038	19,542	58,626	3.00	47.6
1897	1	74	0	54,976	24,007	72,021	3.00	43.7
1898	1	74	0	35,384	18,350	64,225	3.50	51.9

The character of the coal used in the manufacture of coke in Wyoming is shown in the following table:

Character of coal used in the manufacture of coke in Wyoming since 1891.

Year.	Run of mine.		Slack.		Total.
	Unwashed.	Washed.	Unwashed.	Washed.	
	Short tons.	Short tons.	Short tons.	Short tons.	Short tons.
1891.....	0	0	4,470	0	4,470
1892.....	0	0	0	0	0
1893.....	0	0	5,400	0	5,400
1894.....	0	0	8,685	0	8,685
1895.....	0	0	10,240	0	10,240
1896.....	0	0	41,038	0	41,038
1897.....	0	0	54,976	0	54,976
1898.....	0	0	35,384	0	35,384

INDEX.

	Page.		Page.
Abrasive materials, summary	11	Beaver coke district, Pennsylvania	589
Acknowledgments of assistance	3	Belgium, iron trade	93
Alabama, coal	394-397	manganese ores	148
labor employed in mines	394, 395	Bessemer steel, production	77
machine-mined	394	Birkinbine, John, paper on iron ores	27-59
percentage of total product	393	manganese ores	125-158
strikes in mines	394	Blossburg coke district, Pennsylvania	591
coke	554-557	Bolivar, iron trade	99
Semet-Solvay, by-product plant	545	Borax, summary	12
iron ores	39	Boston, Mass., coal trade	355-357
manganese	130	Boston and Montana [copper] Company's report	179
Allegheny County, Pa., iron and steel pro- duction	86	Brazil, iron trade	99
Allegheny Valley coke district, Pennsylv- vania	590	manganese	140
Aluminum and bauxite	267-269	Broad Top coke district, Pennsylvania	587
Aluminum, imports	268	Bromine, summary	12
production	267	Buffalo, N. Y., coal trade	367-369
summary	7	California, coal	400-401
Anaconda copper mine report	179	labor in mines	401
Analyses, iron ores, Lake Superior	33-36	copper	185
Montana	57, 58	manganese	131
manganese ores, Chile	145, 146	Calumet and Hecla copper mine, report	172
Cuba	140	Canada, iron trade	99
Anthraxite coal, by William W. Rulley	457-480	manganese	138
Antimony, by Edward W. Parker	283-289	nickel production	280
imports	285, 286	Cape Copper Company, report	219
prices	286-288	Caswell, A. E., quoted on lead imports	239
production since 1880	284	Cement, summary	10
recent developments	285	Central copper mine, report	177
summary	7	Chamberlin, John, on coal trade of Buffalo, N. Y.	367-369
uses	288, 289	Chemical materials, summary	11
Utah	285	Chicago, Ill., coal trade	374
Arizona, copper	180	Chile, manganese ores	142
Arizona Copper Company's report	181	analyses	145, 146
Arkansas, coal	397-400	China, iron trade	98
labor employed in mines	398	Chromic iron ore	291-292
machine-mined	398	imports	292
strikes in mines	398	Cincinnati coke district, Ohio	570
manganese	130	Ohio, coal trade	379-383
Asbestos, summary	15	Clays, summary	10
Asia, manganese ores	154	Clearfield-Center coke district, Pennsylv- nia	587
Asphaltum, royalty on	413	Cleveland, Ohio, coal trade	370-372
summary	14	Coal, by Edward W. Parker	295-507
Atlantic copper mine, report	175	Alabama	394-397
Australasia, iron trade	98	amount used in making coke	394
manganese ores	156	machine-mined	343, 394
Austria, manganese ores	152	percentage of total product	393
Austria-Hungary, iron trade	94	prices	395
Barytes, summary	13	production, 1870-1898	397
Bauer by-product coke, plants in Germany	553	anthracite	306-308
Bauxite, production	269	anthracite and bituminous, divisions	297
summary	15		

	Page.		Page.
Coal, anthracite mines, labor	307, 308	Coal, Ohio, machine-mined	343, 449
anthracite, New Mexico	444	percentage of total product	393
diminished consumption	455	Oregon	453, 454
New Mexico and Colorado	308	Pennsylvania	454-485
Pennsylvania	306	anthracite, by Wm. W. Raley	457-480
production	306	directory of coal mines	463-479
Arkansas	397-400	mining companies, general offices ..	480
machine-mined	398	shipments of, 1820-1898	459-460
production	397, 398	bituminous, machine-mined	342, 343, 454
machine-mined	344-347	percentage of total product	393
California production, by counties ..	400, 401	product compared with total United	
coke, amount used in making	538-540	States, since 1880	456
kinds used in manufacture ..	540-542, 600	percentage yield in coke	536-537
Colorado, machine-mined	343, 402	Pittsburg, Pa., Monongahela River	
rank in coal production	398	shipments	365
Connellsville, Pa., coke district	577-583	Pocahontas or Flat Top field in West	
consumed in coke making, 1880-1898 ..	532-534	Virginia	498
Cumberland field, shipments from since		prices at mines, by States, since 1886 ..	327, 328
1842	432, 433	production	305-323
Eastern States, production	398	since 1880	314-316
exports	329	by States	310-313, 393-507
Fairmont or Upper Monongahela field,		and value by States, from 1896-1898,	
West Virginia	429	with increase in 1898	817-823
fields of the United States, classifica-		of minor coal-producing countries,	
tion, area, and production ..	297-304	since 1868	338-341
Georgia	405	world's, by countries since 1868 ..	833-837
Idaho	406	Southern States, production	393
Illinois	406-409	standards of measurement	296
machine-mined	343	statistics, how obtained	295
machines used in mines	406	summary	8
percentage of total product	393	tariff on, from 1824 to 1897	329
production, decrease in 1898	406	Tennessee	485-488
imports and exports	329-331	machine-mined	485
increase of production since 1837	298	Texas	488-490
Indiana	409-412	Upper Potomac field in West Virginia ..	499
machine-mined	343, 409	Utah	490-492
Indian Territory	412-416	Virginia	492-494
decision regarding the royalty on,		Washington	494-497
by Secretary of Interior ..	413-415	West Virginia	497, 504
machine-mined	415	machine-mined	343, 499
Iowa	417-420	percentage of total product	393
machine-mined	417	Western States, production	393
rank in coal production	398	World's production	332-337
Kansas	420-423	Wyoming	504-507
Kentucky	423-428	machine-mined	504
machine-mined	423	Coal trade review	347-392
kinds used in coke making	540-542, 600	Boston, Mass.	355-357
labor in mines since 1890	324-326	Buffalo, N. Y.	367-369, 378
Maryland	429-433	Chicago, Ill.	374
Cumberland coal fields	429, 432, 433	Cincinnati, Ohio ..	379-383
Michigan	434, 435	Cleveland, Ohio ..	370-372
machine-mined	342	Milwaukee, Wis.	375-379
new mines in	434	Mobile, Ala.	386
mined by machines in 1898	342-347	New York City	349-354
Missouri	436-440	Norfolk, Va.	387
machine-mined	436	Philadelphia, Pa.	357-363
Montana	440-443	Pittsburg, Pa.	363-367
Nebraska	443	St. Louis, Mo.	383-386
New and Kanawha river field, in West		San Francisco, Cal ..	388-391
Virginia	498	Seattle, Wash.	391
New Mexico	443-446	Superior, Wis.	379
New Mexico, machine-mined	342, 444	Toledo, Ohio	372
North Carolina	446	Cobalt. (See Nickel and cobalt.)	
North Dakota	447, 448	Cobalt oxide, imports	278
Northern States	393	production	278
Ohio	448-453	summary	14

INDEX.

611

	Page.		Page.
Coke, by E. W. Parker.....	509	Coke, Virginia	595
Alabama	554-557	Washington	597
coal used in manufacture of.....	394	West Virginia	598-606
Allegheny Valley district, Pennsylv-		by districts	600-606
ania	590	Wisconsin	607
Beaver district, Pennsylvania.....	589	Wyoming.....	608
Blossburg district, Pennsylvania.....	591	Colombia manganese.....	142
Broad Top district, Pennsylvania.....	587	Colorado, anthracite coal	308
by products	544	coal, labor employed in mines	403
by-product plants, Bauer	553	machine-mined	402
Newton-Chambers	552	strikes in mines.....	402
Otto-Hoffmann	548-552, 553	coke	557
Semet-Solvay	545-547	iron ores	41
Cincinnati, Ohio, district.....	570	manganese	132
Clearfield-Center district, Pennsylv-		rank of, among coal-producing States ..	393
nia.....	586	Connecticut iron ores	42
coal, amount used in making.....	538-540	Connellsville coke district, Pennsylvania. 577-583	
per ton of coke.....	538	Convict labor in coal mines, Alabama	343
consumed in manufacture.....	532-535	Copper, by Charles Kirchhoff.....	159-220
kinds used in manufacture.....	540-542, 600	Anaconda mine	179
percentage yield of.....	536-537	Arizona	180
Colorado	557	Arizona Copper Company's report.....	181
Connellsville district, Pennsylvania. 577-583		Atlantic mine, report.....	175
establishments, number, by States....	516-519	Boston and Montana Company's report.	179
exports	544	California	185
Georgia	559	Calumet and Hecla mine, report.....	172
Greenburg district, Pennsylvania	592	Cape Copper Company, report.....	219
Illinois.....	560	Central mine, report	177
imports	543	consumption, European countries.....	217
Indiana	561	English trade	206
Indian Territory.....	562	exports.....	194
Irwin district, Pennsylvania.....	593	fine	199
Kanawha district, West Virginia.....	604	France	213
Kansas.....	564	Germany.....	216
Kentucky.....	565	Great Britain	211
Missouri.....	566	foreign mines, production.....	169
Montana.....	567	foreign producers.....	217
New Mexico.....	568	Franklin mine, report	174
New River district, West Virginia.....	603	French trade	212
New York	569	German trade	214
Ohio	569-572	Idaho	182
Ohio district, Ohio	571	imports	187
ovens building, by States.....	522	imports into France.....	211
number, by States.....	519-522	Germany	215
Pennsylvania	573-593	Great Britain	206-209
by districts	575-593	markets.....	198
Pittsburg coke district, Pennsylvania..	588	Mason & Barry, Limited, mines (Portu-	
Pocahontas Flat Top district, West		gal)	219
Virginia	602	Montana	178
price per ton.....	538	Nevada	185
prices, 1880-1898.....	529	New Mexico	185
production by States.....	510-515, 554-608	North Carolina.....	186
since 1880	516, 523-525	Osceola consolidated mine, report	176
rank of States in production, 1880-1898..	531	production, by months.....	168
Reynoldsville-Walston district, Penn-		States.....	161-165
sylvania	590	Quincy mine, report.....	173
summary.....	9	Rio Tinto Company, production.....	218
Tennessee	593	Russian trade.....	216
Texas.....	595	Spanish mines	218
Upper Connellsville district, Pennsylv-		summary.....	7
ania	584	Tamarack mine, report.....	172
Upper Monongahela district, West Vir-		Tennessee.....	186
ginia.....	606	trade conditions	159
Upper Potomac district, West Virginia.	605	Utah	182
Utah	595	Vermont.....	186
value	526-528	world's consumption	202-205

	Page.		Page.
Corundum and emery, summary	11	History of gold mining and metallurgy in the Southern States, by H. B. C. Nitze	111-123
Cox, James, on coal trade of St. Louis, Mo.	383-396	Idaho, coal	406
Crucible steel production	78	copper	182
Cuba, manganese	139	Illinois, coal	406-409
exports	71	labor employed in mines	407
manganese ores, analyses	140	machines used in mines	406
Eastern States, coal production	393	percentage of total product	393
Emery. (<i>See</i> Corundum and emery.)		strikes in mines	343, 406
England, Edward E., on coal trade of Mo- bile, Ala	386	coke	560
Europe, manganese ores	147	Imports, antimony	285
Exports, coal	329-331	chromic iron ore	292
coke	544	coal, 1867-1898	329
copper	194	cobalt oxide	278
fine	169	coke	543
France	213	copper	187
Germany	216	into France	211
Great Britain	211	into Germany	215
iron and steel	72	into Great Britain	206-209
iron ores	55	iron and steel	71
lead	233-239	iron ore	53, 68
manganese, from Cuba	71	lead	233-239
nickel oxide	280	manganese	136
zinc	254	manganese ore from Cuba	71
Fairmont or Upper Monongahela coal field.	499	nickel	279
Feldspar, summary	14	pig iron	71
Flint, summary	14	quicksilver	274
Fluorspar, summary	12	spiegeleisen	71
Foreign iron trade in 1898 and immediately preceding years, by James M. Swank	89-101	sine	254
France, copper, exports	218	sine oxide	256
copper trade	212	India, iron trade	98
iron trade	93	manganese ores	154
manganese ores	147	Indiana, coal	409-412
nickel, production	281	labor employed in mines	410
Franklin copper mine, report	174	machine-mined	409
Fuller's earth, summary	14	coke	561
Galena-Joplin zinc district	252-253	Indian Territory, coal	412-416
Garnet, summary	11	decision regarding royalty on, by Secretary of the Interior	413-415
Georgia, coal	405	labor employed in mines	416
coke	559	machine-mined	415
iron ores	42	strikes in mines	415
manganese	132	coke	562
Germany, coke, by-productovens, Bauer ..	553	Infusorial earth, summary	11
copper, exports	216	Iowa, coal	417-420
copper trade	214	labor employed in mines	418
iron trade	91	machine-mined	417
manganese ores	148	strikes in mines	417
nickel production	281	rank, among coal-producing States	393
Gold and silver	103-123	Iron and steel, exports	72
production	103-111	imports	71
Gold, summary	7	monthly prices	65
Graphite, summary	15	plates and sheets, production	82
Great Britain, copper exports	211	production of leading articles	64
iron trade	90	rails, production	80
manganese ores	147	rolled, production	84, 86
Greece, iron trade	97	shipbuilding	87
Greensburg coke district, Pennsylvania ..	592	structural shapes, production	81
Grindstones, summary	11	summary	6
Gypsum, summary	11	world's production	101
Harrison, J. W., on coal trade of San Fran- cisco, Cal.	388-391	Iron, blooms and billets, production	87
Havens, Munson A., on coal trade of Cleve- land, Ohio	370-372	Iron ores, by John Birkinbine	27-56
		Alabama	39
		analyses, Lake Superior	33-36
		Montana	57, 58

	Page.		Page.
Iron ores, Colorado	41	Japan, manganese ores	155
Connecticut	42	Joplin-Galena lead district	229
consumption	70	zinc district	252
docks, records	49	Kanawha coke district, West Virginia	604
exports	55	Kansas, coal	420-423
Georgia	42	labor employed in mines	421
imports	53, 69	coke	564
Kentucky	42	Kentucky, coal	423-428
Maryland	42	labor employed in mines	425
Massachusetts	42	machine-mined	423
Michigan	37	strikes in mines	423
mines producing 50,000 tons or more	45	coke	565
Minnesota	37	iron ores	42
Missouri	41	Kirchhoff, Charles, paper on copper	159-220
Montana	42, 55	lead	221-247
Nevada	42	zinc	249-266
New Jersey	41	Kirkpatrick, Samuel R., on coal trade of Philadelphia, Pa	357-363
New Mexico	42	Labor in coal mines, anthracite	307
New York	42	bituminous, Alabama, convict	343
North Carolina	42	Arkansas	398
Ohio	42	California	401
Pennsylvania	40	Colorado	403
prices, Lake Superior	67	Illinois	407
production	27	Indiana	410
receipts, at Lake Erie ports	51, 70	Indian Territory	416
receiving docks, capacity, at Lake Erie ports	53	Iowa	418
shipments	48	Kansas	421
Lake Superior	69	Kentucky	425
lower lake ports	52	Maryland	431
stocks	43	Michigan	435
lower lake ports	52	Missouri	438
summary	7	Montana	441
Tennessee	40	New Mexico	444
Texas	42	North Dakota	447
transportation	47	Ohio	451
Utah	42	Oregon	453
Virginia	40	since 1890	324-326
Wisconsin	41	Tennessee	486
Wyoming	42	Texas	489
Iron trade, Austria-Hungary	94	Utah	491
Australasia	98	Virginia	493
Belgium	93	Washington	495
Bolivia	99	West Virginia	501
Brazil	99	Wyoming	505
Canada	99	Lake Superior copper, production by mines	170
China	98	iron ores	81
France	93	analyses	33-36
general review	61	prices	67
Germany	91	production	32
Great Britain	90	shipments	69
Greece	97	manganese	133
India	98	Lamb, William, on coal trade of Norfolk	387
Italy	96	Langson, William J., on coal trade of Mil- waukee, Wis	375-379
Japan	97	Lead, by Charles Kirchhoff	221-247
Newfoundland	99	consumption	231
Norway	95	domestic producers	227
Portugal	96	exports	233-239
Russia	96	on which drawbacks have been paid	233
South African Republic	98	imports	233-239
Spain	95	sources of	240
Sweden	95	markets	244
Irwin coke district, Pennsylvania	593	price, average in Joplin-Galena district	229
Italy, iron trade	96	prices	243
manganese ores	149	production by half-yearly periods	230
Japan, iron trade	97		

	Page		Page
Lead, production, refined	230	Merton, Henry R., & Co., quoted on zinc	
production since 1825	222	production of Europe	263
sources	228	Metallic paint, summary	12
summary	7	Metals, summary	6
warehouse transactions	240	Mica, summary	14
world's consumption	247	Michigan coal	434
world's production	245	labor employed in mines	435
Limestone for iron flux	77	new mines	434
summary	15	strikes in mines	434
Litharge, summary	13	iron ores	37
McCabe, John M., on coal receipts at Superi- rior, Wis	379	Millstones, summary	11
Machine-mined bituminous coal	344-347	Milwaukee, Wis., coal trade	375-379
Magnesite, summary	15	Mineral waters, summary	15
Manganese ores, by John Birkinbine	125-158	Minnesota, iron ores	37
Manganese ores, Alabama	130	Missouri, coal	436-440
analyses, Chile	145, 146	labor employed in mines	438
Cuba	140	machine-mined	436
Arkansas	130	strikes in mines	435
Australasia	156	coke	506
Austria	152	iron ores	41
Belgium	148	Mobile, Ala., coal trade	386
Brazil	140	Monazite, summary	15
California	131	Monongahela River, coal shipments	365
Canada	138	Montana, coal	440-443
characteristics of	157	labor employed in mines	441
Chile	142	coke	507
Colombia	142	copper	178
Colorado	132	iron ores	42, 56
Cuba	139	analyses	57, 58
Europe	147	Murray, Charles B., on coal trade of Cincin- nati, Ohio	379-383
foreign countries	138	Nails, cut, production	84
France	147	wire, production	85
Georgia	132	Natural gas, summary	10
Germany	148	Nebraska, coal	443
Great Britain	147	Nevada coal	443
imports	136	copper	185
from Cuba	71	iron ores	42
India	154	New and Kanawha river coal field, West Virginia	498
Italy	149	Newfoundland, iron trade	99
Japan	155	New Jersey iron ores	41
Lake Superior region	133	New Mexico, coal, anthracite	308
Pennsylvania	135	bituminous	443-446
Russia	153	labor employed in mines	444
South America	140	machine-mined	444
Spain	151	coke	508
summary	8	copper	185
Sweden	153	iron ores	42
Tennessee	135	New River coke district, West Virginia	603
uses	158	Newton-Chambers by-product coke plant	552
Virginia	135	New York City coal trade	349-354
world's production	156	New York coke	509
Manganese and manganiferous ores, produc- tion	130	iron ores	42
Manganiferous iron ores, production	127	Nickel, Canada, production	280
silver ores, production	128	foreign production	280
zinc residuum, production	129	France, production	281
Maryland, coal	429-433	Germany, production	281
labor employed in mines	431, 432	imports	279
pick mining	429	summary	8
iron ores	42	Nickel and cobalt	277-281
Mason & Barry, Limited (Portugal), copper mines	219	Nickel oxide, exports	280
Massachusetts, coke, by-product plant, Otto-Hoffmann	548-552	Nitze, H. B. C., paper by, on history of gold mining and metallurgy in the Southern States	111-123
iron ores	42	Norfolk, Va., coal trade	387

INDEX.

615

	Page.		Page.
North Carolina, coal.....	446	Prices, coal, anthracite, at Philadelphia	359
copper	186	St. Louis, Mo.	385
iron ores	42	coal, bituminous at mine.....	327
North Dakota, coal.....	447	in Alabama	396
labor employed in mines	447	Arkansas	398
Northern States, production of coal	393	California	401
Norway, iron trade.....	95	Colorado	403
Ocher, summary.....	13	Illinois.....	407
Ohio, coal	448-453	Indiana	410
labor employed in mines	451	Iowa	417
machine-mined	449	Kansas	421
percentage of total product	393	Kentucky.....	425
strikes in mines.....	446	Michigan.....	435
coke	560-572	Missouri	438
iron ores	42	Montana	440
Ohio coke district, Ohio	571	New Mexico	444
Oilstone, summary	11	North Dakota.....	447
Open-hearth steel, production.....	78	Ohio	451
Orange mineral, summary	13	Oregon	453
Oregon, coal.....	453	Tennessee.....	486
labor employed in mines	453	Texas	489
Osceola Consolidated copper mine report.....	176	Utah	491
Otto-Hoffmann, by-product coke plants ..	548-553	Virginia	493
Parker, Edward W., paper on antimony..	283-289	Washington	495
coal	295-507	West Virginia	501
coke	500-608	Wyoming	505
Pennsylvania anthracite coal, by William		coke (Connellsville).....	583
W. Ruley	457-480	per ton	538
Pennsylvania anthracite mines, directory.	468-479	iron and steel	65
Pennsylvania coal, anthracite, tabular state-		iron ore, Lake Superior	67
ment of coal fields, and rail-		lead	242
roads reaching them.....	461	quicksilver	274
bituminous.....	454-456	zinc	259-262
machine-mined.....	454	in Galena-Joplin district.....	253
percentage of total product.....	393	Pyrrite, summary	12
coke	572-593	Quicksilver	271-275
by-product plants, Otto-Hoffmann..	553	imports	274
iron and steel, Allegheny County ..	86	prices	274
iron ores	40	production	271
manganese	135	summary	7
Petroleum, summary	10	Quincy copper mine, report.....	173
Philadelphia coal trade	357-363	Rails, iron and steel production.....	80
Phosphate rock, summary	11	Red lead, summary	13
Pig iron, consumption.....	76	Reynoldsville-Walston coke district, Penn-	
imports	71	sylvania	590
limestone used in manufacture.....	77	Rio Tinto [copper] Company, production...	218
production	28	Rolled iron and steel, production.....	84
production by fuels used	76	Ruley, William W., paper on Pennsylvania	
by States	75	anthracite	457-480
Pigments, summary	12	Russia copper trade.....	216
Pittsburg, Pa., coal trade.....	363-367	iron trade	96
Pittsburg coke district, Pennsylvania	588	manganese ores	153
Platinum	293	St. Louis, Mo., coal trade	383-386
Pocahontas or Flat Top coal field, West		Salt, summary	13
Virginia	498	San Francisco, Cal., coal trade.....	388-391
Pocahontas Flat Top coke district, West		Saward, F. E., on coal trade of New York.	349-354
Virginia	602	Scope of report.....	3
Portugal, iron trade.....	96	Seattle, Wash., coal trade	391
Precious stones, summary	14	Secretary of Interior, decision regarding	
Preston, Elwyn G., coal trade of Boston.	355-357	royalty on coal in Indian Ter-	
Prices, antimony.....	286-288	ritory	413-415
coal, anthracite at mine.....	327	Semet-Solvay by-product coke ovens	545-548
at Buffalo, N. Y.....	369	Shipbuilding, iron and steel.....	86
Cleveland	372	Sienna, summary	13
Milwaukee	379	Silver, summary	7
New York	350	Smith, Dennison B., on coal trade of Toledo.	372

	Page.		Page.
Soapstone, summary	15	Utah, iron ores	42
South African Republic, iron trade	98	Umbur, summary	13
South America, manganese	140	Upper Connellsville coke district, Pennsyl-	
Southern States, coal, production	393	vania	585
Spain, copper	218	Upper Monongahela coke district, West	
iron trade	95	Virginia	606
manganese ores	151	Upper Potomac coal field, West Virginia ..	490
Spelter. (See Zinc.)		Upper Potomac coke district, West Virginia ..	605
Spiegeleisen, imports	71	Venetian red, summary	13
Stanton, John, quoted on copper product ..	169	Vermont, copper	186
Statistics of the American iron trade for		Virginia, coal	492-494
1898, by James M. Swank	61-88	labor employed in mines	493
Steel. (See Iron and steel.)		coke	595
Bessemer, production	77	by-product plant, Newton-Cham	
crucible, production	78	bers	552
foreign countries	89-101	iron ores	40
open-hearth, production	78	manganese	135
plates and sheets, production	82	Washington, coal	494-497
rails	80	labor employed in mines	495
Stibnite. (See Antimony.)		coke	597
Stone, summary	10	Western States, coal, production	393
Strikes in coal mines, Alabama	394	West Virginia, coal	497-504
Arkansas	398	labor employed in mines	501
Colorado	402	machine-mined	499
Illinois	343, 406	percentage of total product	393
Indian Territory	415	strikes in mines	499
Iowa	417	coke	598-606
Kentucky	423	by-product plant, Semet-Solvay ..	547
Michigan	434	White lead, summary	18
Missouri	436	Wire nails, production	83
Ohio	449	Wire rods, production	82
West Virginia	499	Wisconsin, coke	607
Structural materials, summary	10	iron ores	41
Sulphur, summary	12	Wood, Lovett M., on coal trade of Seattle ..	391
Summary of mineral products	8	World's coal production	332
Superior, Wis., coal trade	379	copper consumption	202-205
Swank, James M., paper on statistics of the		lead consumption	247
American iron trade for 1898. 61-88		production	245
foreign iron trade in 1898 and imme-		manganese ores production	156
diately preceding years	89-101	pig iron and steel production	101
Sweden, iron trade	95	Wyoming, coal	504-507
manganese ores	153	labor employed in mines	505
Tamarack copper mine report	172	machine-mined	504
Tariff on coal, 1824-1879	329	coke	608
Tennessee, coal	485-488	iron ores	42
labor employed in mines	486	railroads penetrating coal region	505
machine-mined	485	Zinc, by Charles Kirchhoff	249-266
wage rates	485	consumption	234
coke	593	exports	254
copper	186	foreign production by countries	263
iron ores	40	imports	254
manganese	135	manganiferous residuum	129
Texas, coal	488-490	Merton, Henry R. & Co., quoted on	
labor employed in mines	489	zinc production of Europe	263
coke	595	mining in Galena-Joplin district	252-253
iron ores	42	oxide, imports	256
Tin plates, production	87	prices	259-262
Toledo, Ohio, coal trade	372	in Galena-Joplin district	253
Utah, antimony	285	production	249
coal	490-492	by half-yearly periods	250
labor employed in mines	491	summary	7
coke	595	Zinc, white, summary	13
copper	182		





3 2044 102 939 014